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## PATHOLOGY OF RENAL TUMORS<sup>1</sup>

By ALLEN GRAHAM, M.D., Cleveland Clinic, CLEVELAND, OHIO

THIS paper is limited to a consideration of tumors of the kidney and perirenal region, particular attention being given to the gross pathological features which may have an important bearing upon the interpretation of roentgenograms. The more frequent types of intra- and extra-renal neoplasms and lesions simulating neoplasms are discussed briefly, and points of interest in each group are noted.

### GENERAL CONSIDERATIONS

*Embryological.*—By reason of the embryological derivation of the kidney and the intimate anatomical relationship of the original anlage to the anlage of other important organs and structures in the immediate vicinity, it is not difficult to conceive of misplacements and inclusions of tissues which are not ordinarily destined to be integral parts of the fully differentiated kidney. The anatomical possibility of such inclusions affords one explanation for the occurrence of intra-renal neoplasms, the structure of which has little or no resemblance to the kidney substance.

An alternative explanation for the occurrence of heterotopic neoplasms in the kidney, which is also derived from embryo-

logical investigations, is based upon the fact that a mass of undifferentiated cells of common origin have the capacity of differentiating along diverse lines and of resulting in the establishment of organs and tissues so obviously different in structure and function that their primordial common ancestry is easily forgotten. Deviations from the line of normal differentiation or incomplete differentiation along the normal line may eventuate in the presence of two structurally different tissues of identical origin in the same organ. Granting this theoretical possibility, it should not seem strange that the apparently ectopic tissue may become neoplastic.

Each of the foregoing conceptions of the genesis of neoplasms has the sanction of authority. Neither is accepted to the exclusion of the other.

*De-differentiation, Anaplasia, Metaplasia.*—In the genesis of neoplasms increasing importance is attached to the possibility that adult tissue, under circumstances not too well understood, may revert to a more or less embryonal or undifferentiated state. The multiformity of renal neoplasms conceivably originating in such reverted tissue is limited primarily by the degree to which we are willing to admit that de-differentiation may proceed. If it be conceivable that a renal epithelial cell may revert to a cell

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having the potentialities of its ultimate ancestor, it would not be inconceivable that by a process of growth and re-differentiation it might develop the characteristics of an adrenal epithelial cell. Thus we have a third possible explanation of heterotopic neoplasms.

In a restricted sense, metaplasia implies the transition of one type of tissue into another type. That such a process has to be considered in the kidney is evidenced by the fact that the mucosa of the renal pelvis, which under normal conditions is not of the squamous type and has no keratohyaline material, may be totally converted into a type of epithelium morphologically identical with skin. From this altered mucosa epidermoid neoplasms may develop.

*Statistical.*—Renal neoplasms occur at all ages: more than 50 per cent of cases occur in the fourth and fifth decades. Experience has indicated the desirability of grouping the cases occurring in children separately from those occurring in adults. The predominating type of tumor differs in the two groups and there are also distinct differences in the clinical course, operability, dissemination, and response to roentgenotherapy. These differences will be given further attention under the discussion of the various types of tumor.

About 70 per cent of the cases of renal tumor occur in males. Comparative statistics concerning the incidence of the various types of renal neoplasms is increasingly difficult to obtain from the numerous clinics where comparatively large numbers of these cases are treated. This is due chiefly to differences in the interpretation of the two most frequently encountered types of neoplasms, namely, hypernephroma and carcinoma. It is not surprising, therefore, that in one clinic about 80 per cent of all malignant renal neoplasms may be classified as hypernephromata, and in another clinic less than 30 per cent are so classified. It

is highly improbable that the Grawitzian tumor is less prevalent to-day than it was twenty-five years ago.

#### THE MORE FREQUENTLY ENCOUNTERED TYPES OF RENAL NEOPLASMS

*Hypernephroma.*—The type of lesion described by Grawitz is the most frequently encountered, and, therefore, is the most important neoplasm of the kidney. That it originates in adrenal cortical tissue, which is included in the kidney during its developmental period, has been disputed recently. Whatever may be the final judgment in the matter, segregation of this group of tumors seems amply justified by embryological, gross, microscopical, chemical, and clinical considerations. This type of tumor rarely occurs in children, but is the prevailing type of renal neoplasm of adult life, occurring in males more frequently than in females. It may be situated in any part of the kidney but is found more frequently in the upper pole. It is rarely bilateral.

The lesions observed at operation or autopsy are rarely less than three centimeters in diameter. Generally they are larger and may attain a diameter of from ten to fifteen centimeters.

Many of the smaller lesions are partially or completely encapsulated. In such instances the tumor increases by local growth without invasion of the surrounding renal tissue. The kidney parenchyma may become atrophic as the result of compression. Tumors of this sort may grow slowly and there are indications that they may be present for years without producing symptoms. We have no means of knowing what percentage of hypernephromata has such a benign beginning, nor what percentage pursues a relatively benign course. Whether or not these hypernephromata are encapsulated in their early stages, in the advanced stage they show an alarming tendency to

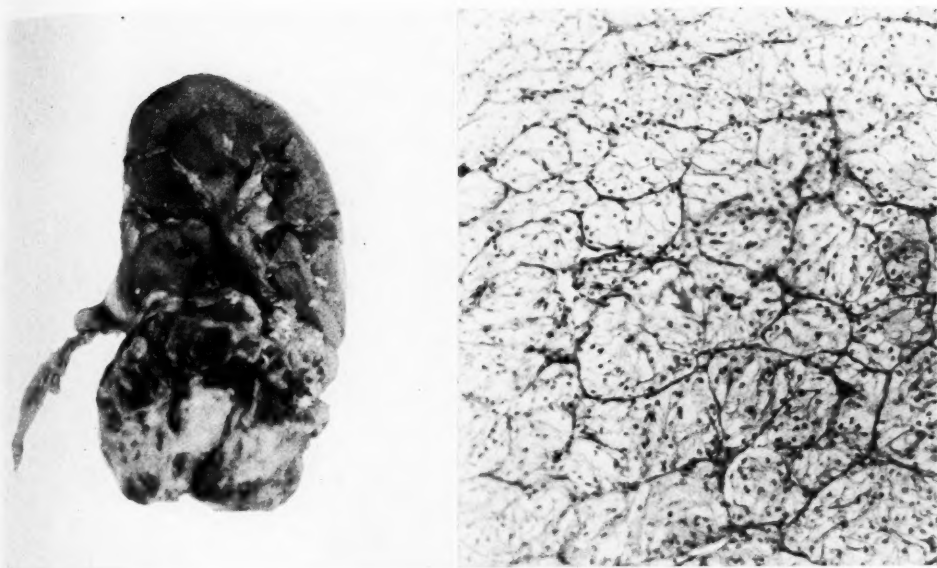


Fig. 1. Hypernephroma in lower pole of kidney. Histological structure typical.

invade the capsule and the surrounding tissues and to behave in all respects as malignant neoplasms.

The larger tumors, in many instances, show little or no evidence of encapsulation and may infiltrate one or the other pole of the kidney (Fig. 1), the mid-portion (Fig. 2), or the entire kidney (Fig. 3). The dense, fibrous capsule of the kidney interposes a fairly efficient barrier against invasion of the perirenal tissues, although in a number of cases the renal capsule is perforated by the tumor growth. The renal pelvis likewise affords a modicum of restraint, but at times is perforated and the pelvic sac may be filled with tumor tissue.

One of the most striking features of hypernephromata is their tendency to invade the branches of the renal vein. From the renal vein the tumor tissue may extend continuously through the inferior vena cava to the right side of the heart. This may occur with or without adherence of the tumor tissue to the walls of the vascular channels.

On the other hand, the tumor thrombus may remain limited to the branches of the renal vein or to the renal vein itself and a blood thrombus may extend to the inferior vena cava or the right heart. In either case, emboli may be set free and find lodgment in the lungs, the results being determined by the number, size, and location of the emboli. Tumor cells passing through the right side of the heart may also pass through the lung to the left heart, and thence to any part of the body.

On gross examination, hypernephromata may appear as circumscribed, encapsulated, or diffusely infiltrating masses. They are usually soft, light yellow in color, and are frequently complicated by varying degrees of diffuse hemorrhage and necrosis. On account of these qualities they can be recognized, in the majority of cases, from their gross appearance. In some cases the color is more white than yellow and the tumor is firmer in consistency than is usual, therefore, in such cases gross diagnosis becomes

more difficult. The amount of fibrous tissue in the tumor is also variable, particularly in the infiltrating tumors.

On microscopical examination, hypernephromata present extreme variations in

old hemorrhages, with deposition of blood pigment, proliferation of fibroblasts, and inflammatory infiltration. The amount of doubly refractile lipoid material in the tumor cells also varies greatly in different

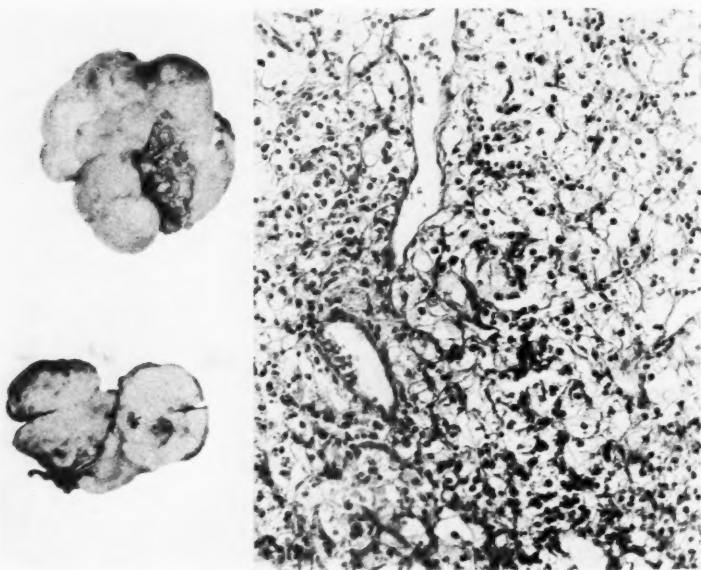


Fig. 2. Hypernephroma, dumb-bell shaped, in mid-portion of kidney. Histological structure typical.

structure. In almost all cases the usual alveolated arrangement of large, clear vesicular tumor cells with relatively small nuclei, the palisading of cells along a fine vascularized stroma or capillary network, the sharp outlines of the individual tumor cells, may be recognized in some portion of the tumor. In the same tumor, however, there may be most extraordinary deviations from this typical histological picture. The tumor cells may be smaller, less vesicular, more spindle-shaped, and arranged in small, solid nests or long, solid cords, without definite palisading. In other portions of the same tumor the tissue may have a pseudo-glandular (Fig. 4) or pseudo-papillomatous arrangement. The picture may be complicated further by recent and

tumors and in different portions of the same tumor.

The present tendency to classify the Grawitz tumor as a carcinoma originating from renal epithelium may be attributed very largely to its tendency to deviate from its histological type, as indicated above.

*Carcinoma.*—Second in order of frequency and importance among renal neoplasms are the carcinomata, which may be considered under two groups: (a) those arising from tubular or glandular epithelium, and (b) those arising from the pelvic mucosa.

(a) Probably the most important source of carcinomata in the substance of the kidney in adults is the adenoma, occurring with comparative frequency (Figs. 5 and 6),



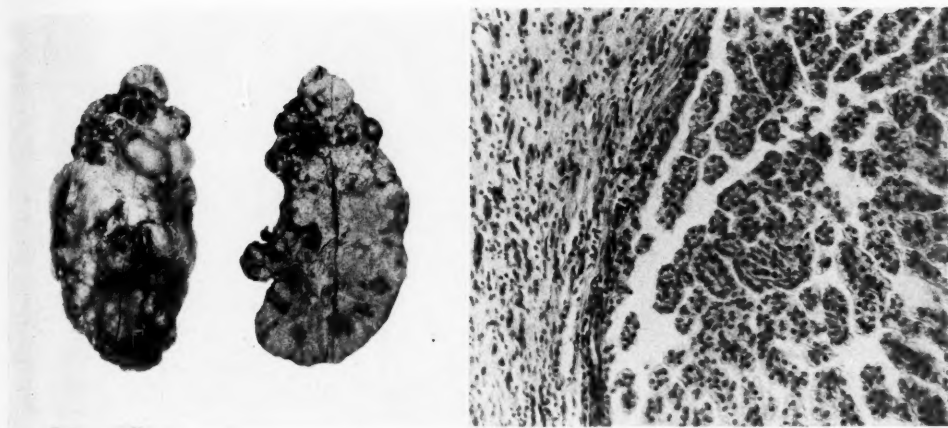


Fig. 3. Hypernephroma involving the entire kidney. Renal vein filled with tumor tissue. Histological structure, in part, pseudoglandular and papilliferous.

which is found in old sclerotic and fibrotic kidneys.

Adenomata are not infrequently encountered at autopsy as single or multiple lesions in one or both kidneys. They are generally small, white, circumscribed, non-encapsulated nodules not exceeding one centimeter in diameter. They are usually situated in the cortical portion of the organ and by their size and position give rise to no symptoms or deformity that can be recognized clinically. On microscopical examination they appear as adenomatoid or adeno-papilliferous structures, apparently representing a transition of the renal parenchyma, and they generally are related to areas of atrophy and fibrosis. When the lesions are of considerable size a more or less well defined capsule may develop.

When the adenoma becomes malignant (carcinoma) fairly well circumscribed or diffusely infiltrating neoplasms of considerable size may result. Clinical manifestations (pain, hematuria, palpable tumor), anatomical alterations, and abnormalities noted in roentgenograms and pyelograms naturally depend upon the location, size, and rate of growth of the tumor, and whether or not the pelvis is secondarily involved.

Evidences of malignancy are deviations from the simple epithelium of an adenoma (atypical cytology, mitotic figures, invasion of stroma), and gross or microscopic infiltration of surrounding kidney tissue. Metastases from these tumors usually occur through the lymphatics. Dissemination

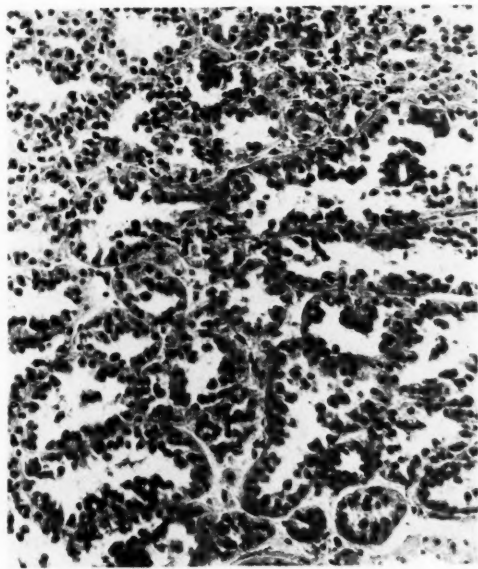


Fig. 4. Hypernephroma with pseudoglandular structure. Section from tumor shown in Figure 2.

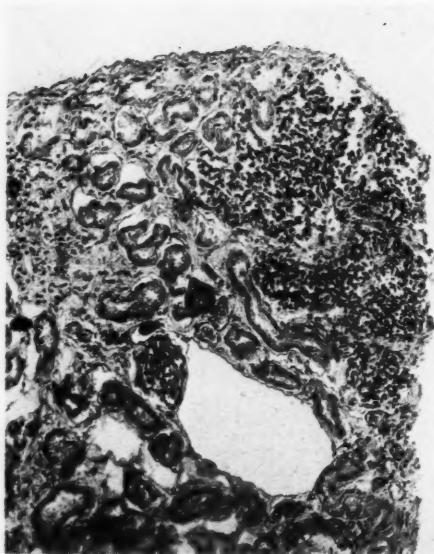


Fig. 5. Section of a white non-encapsulated nodule (adenoma) 2 mm. in diameter, in cortex of kidney, such as is a probable source of many carcinomata of the kidney in adults. (Figure 6 shows a larger adenoma in the same kidney.)

through the blood stream (to lungs, bones, etc.), which is such a striking feature of hypernephroma, is of rare occurrence in the type of carcinoma under discussion. In contrast to hypernephroma, however, which tends to remain localized in the kidney, carcinoma tends to invade surrounding structures. Hence the operative removal of a carcinoma may be more difficult and local recurrence more prone to follow than in the case of a hypernephroma.

In well advanced cases a carcinoma may grow into the pelvis, and at times it is difficult to determine whether the primary site of the tumor was in the kidney or in the pelvis. When the tumor is primary in the kidney, it is more likely to be of a glandular type.

Carcinoma of the kidney in childhood is usually a different type and apparently has a different origin from carcinoma in adults. In children, the tumor is generally more undifferentiated or embryonal in type (Fig.

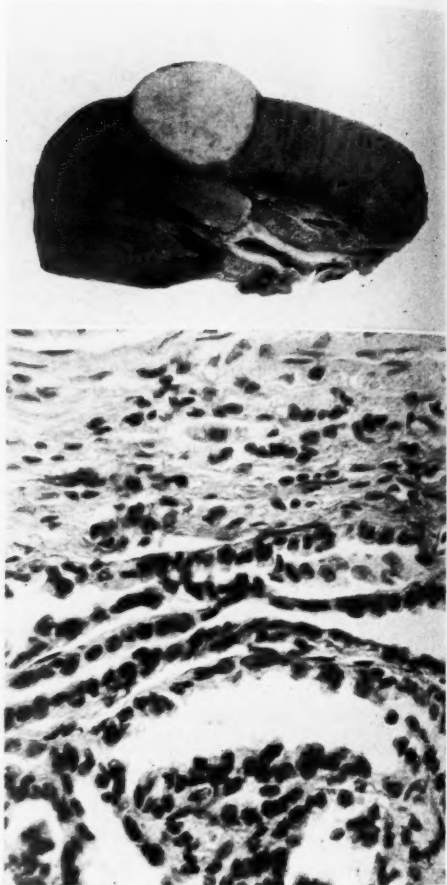


Fig. 6. Gross section of kidney through an encapsulated, yellow, cortical nodule, 1 cm. in diameter. Macroscopically suggestive of adrenal cortical tissue or early hypernephroma; microscopically, a renal adenoma.

7), and in many cases it seems to be of a teratomatous nature, with one type of tissue predominant. Carcinomata in children may grow rapidly and form large tumors, but they show little tendency to distant metastasis. In some cases the tumor remains encapsulated and limited to the kidney; in others, it infiltrates diffusely and extensively. Some of these tumors are remarkably radiosensitive, quite in contrast to carcinomata in the adult.

(b) Carcinomata arising in the renal



Fig. 7. Section of an embryonal glandular carcinoma from a child's kidney. No mixed or teratomatous structures have been detected. This tumor was remarkably sensitive to roentgen therapy.

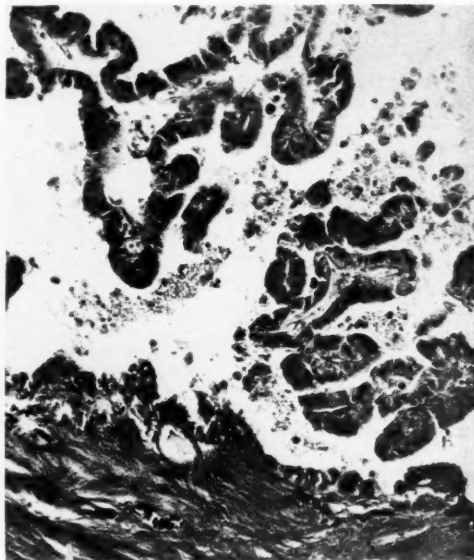


Fig. 8. Papilloma of the renal pelvis. The growth is principally intrapelvic. There is very little invasion of subjacent tissue.

pelvis are of two types—papillomatous and epidermoid.

Papillomatous growths of the renal pelvis (Figs. 8 and 9) are somewhat similar to papillomata of the bladder, and, like the latter, tend to become malignant. The tumor may be limited to one or two calices or it may fill the entire pelvis. In some cases the growth shows little tendency to invade the kidney substance; in other cases the kidney may be extensively infiltrated or largely destroyed. Secondary implantation along the course of the ureter or even into the bladder may occur. Hematuria is almost a constant clinical finding. The ureter may become blocked by tumor tissue or by a blood clot, and hydronephrosis may result. Calculus may form in the pelvis, especially if secondary infection has occurred. As long as these tumors are confined to the pelvis, metastases are slow to develop, but when the kidney is involved metastases may take place through the lymphatics. Blood

stream metastasis is not a frequent mode of dissemination.

Tumors arising in the pelvic mucosa but growing into the kidney substance rather than into the lumen of the pelvis, have the structure of an inverted papilloma. Such tumors are referred to by some authors as epidermoid carcinomata. They are exactly comparable to similar lesions in the bladder. Generally they produce a non-keratohyaline material and do not form pearls.

A true epidermoid carcinoma with keratohyaline material and pearl formation may arise in the pelvis of the kidney, the seat of leukoplakia. These are ulcerative lesions, comparable to similar lesions occurring in the skin. They infiltrate the kidney substance and their usual mode of metastasis is through the lymphatics. These tumors are of relatively infrequent occurrence; they are usually found in chronically infected kidneys or in association with calculus.

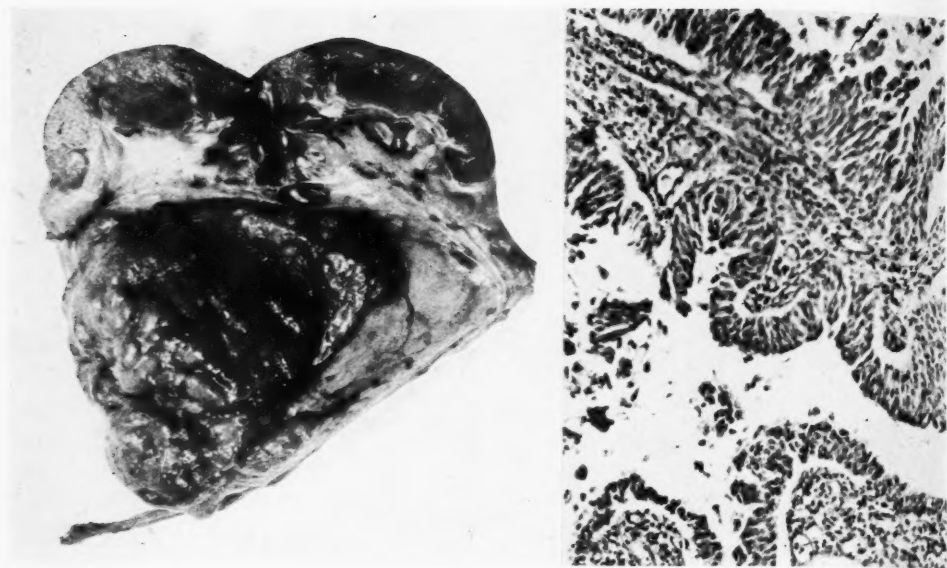


Fig. 9. Intrapelvic papillary carcinoma, the usual type of pelvic neoplasm. A growth of this type may be fungating and only slightly invasive or ulcerative and extensively invasive. Under the latter circumstances it is frequently referred to as "epidermoid carcinoma."

**Sarcoma.**—True sarcoma in the sense of a malignant tumor arising from the supporting tissue (capsule, stroma, or adventitia of blood or lymph vessels) is rarely observed in the kidney as a primary tumor. A rather hurried search of the records of the Cleveland Clinic for the past eight years has failed to disclose a single case. It is more than probable that a large percentage of cases appearing in the literature under the heading of sarcoma would be more appropriately classified as cases of embryonal carcinoma or of mixed tumor of one type or another.

**Mixed Tumors.**—Mixed tumors constitute the third group of renal neoplasms in order of frequency and importance. They are not a homogeneous group and do not conform to a type. In this group are included tumors which are probably variable in derivation, and certainly variable in composition. The one feature that characterizes them as a group is the fact that they com-

prise the majority of renal neoplasms which occur in childhood. Some of these tumors are probably of a teratomatous nature, although it is extremely difficult to decide their nature on account of inability to recognize derivatives of three germ layers. Components from two germ layers are not infrequently encountered. The tissues which enter into the composition of these tumors are embryonal or undifferentiated. The failure of differentiation is such that, in many instances, it is impossible to distinguish with certainty between epithelial and mesoblastic cells.

Mixed tumors usually grow rapidly, form large, clinically detectable masses, are difficult to differentiate from pararenal, retroperitoneal, and intraperitoneal tumors, and show surprisingly little tendency to disseminate distant metastases. They are frequently unaccompanied by symptoms other than a swelling, anemia, and loss of strength. On gross examination many of



them are found to be well encapsulated, and when thus limited they may displace, rotate, or deform the kidney without seriously impairing its function. In this stage, they are usually relatively free from adhesions to surrounding structures; nevertheless, complete surgical removal is rarely accomplished on account of the size of the tumor, the thinness of its capsule, the friability of the tissue, and its great vascularity. Even though they may be encapsulated at first, many of these tumors perforate the capsule and infiltrate extensively into the surrounding tissues.

On microscopical examination, the structure of these tumors is found to be extremely variable. The tissues are rarely of a single uniform type. Generally there are more or less intimate admixtures of epithelial and mesoblastic elements, which in themselves show remarkable morphological variations. The epithelial portions may have a glandular, papilliferous, alveolar, or solid arrangement, or any combination of these. The mesoblastic portions may consist of embryonal connective tissue, mucoid tissue, embryonic muscle tissue, or various combinations of these. Cartilage and bone are not so frequently encountered. Either the epithelial or the mesoblastic elements may dominate the picture. Necrosis, hemorrhage, and cyst formation are frequent complications. When metastases occur the dissemination may be by the blood stream or the lymphatics, or by both routes.

Many of the tumors are radiosensitive and may be kept under control for a considerable period of time by roentgen therapy. The response to irradiation depends, as in the case of tumors generally, upon the degree of undifferentiation. Metastases and recurrences also are radiosensitive in some instances.

*Extra-renal Tumors.*—*Lipomata* may develop in the peripelvic fat of normal kidneys



Fig. 10. Photomicrograph of a true epidermoid, pearl-forming carcinoma of the renal pelvis, probably originating in leukoplakia. Such tumors are usually ulcerative and invasive.

and result in displacement of the organ and deformity of the pelvis. They may develop in the fat which is deposited in kidneys that are atrophic as a result of interference with the circulation or as a result of chronic infection, with or without calculus, or they may develop in the perirenal fatty capsule and by their size misplace an otherwise normal kidney.

*Fibromata, fibrolipomata, or fibromyxomata* may develop in the perirenal tissue. The myxomata may either be encapsulated or diffuse and may become sarcomatous. These tumors may displace, but usually do not invade, the kidney.

*Retroperitoneal neoplasms* such as lymphoblastoma, common sarcoma, endothelioma, and tumors of the adrenal may simulate renal neoplasms.

*Subhepatic, intrahepatic, subdiaphragmatic, or psoas abscesses and omental and*

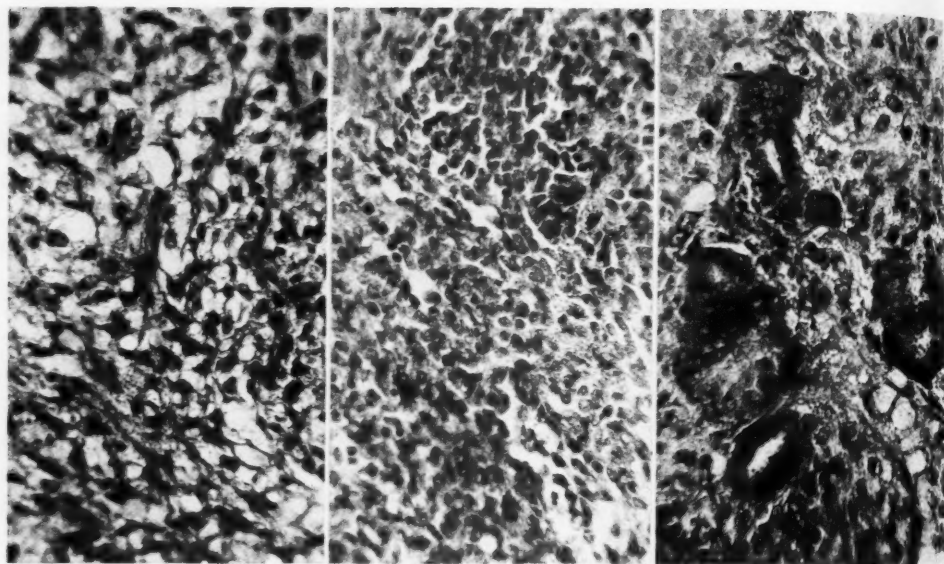


Fig. 11. Photomicrographs of a renal neoplasm in childhood, of mixed type. *Left*: loose reticulated tissue, suggestive of sarcoma. *Middle*: compact cellular tissue, suggestive of carcinoma. *Right*: embryonal glandular tissue in loose cellular stroma.

mesenteric cysts may simulate cystic tumors of the kidney.

#### ROENTGENOLOGICAL INTERPRETATION IN RELATION TO THE PATHOLOGY OF RENAL TUMORS

Roentgenograms of the kidney are photographic representations of the state of the organ at the time of exposure. They indicate the relative size, position, and contour of the kidney, and show relative variations in the density of the shadow of one portion of the kidney as contrasted with another, or of the kidney as contrasted with its surroundings. Additional evidence of normality or abnormality is made available by the efficient injection of opaque media, as in pyelography, which permits visualization of the calices, pelvis, and ureter.

The co-operation that has been established between the urologist and the roentgenologist accounts in great measure for the high

degree of accuracy achieved in the interpretation of variations from the roentgenogram and pyelogram of the normal kidney. The possibility of the recognition of neoplasms, extra-renal, intra-renal, or intrapelvic, as opposed to anatomical defects, congenital malformations, and infective processes, including tuberculosis and calculus with its sequelae and complications, is very gratifying.

There are, however, certain limitations in the differentiation of the types of tumors that may be responsible for abnormal appearances in the roentgenogram or pyelogram. This is due to the fact that dissimilar types of neoplasms may present similar gross physical characteristics, and also to the fact that the same type of neoplasm may present dissimilar gross physical characteristics on different occasions and in different cases. In general, it is simpler to differentiate between a benign and a malign-

nant tumor, which, after all, is the more important part of the problem, than it is to differentiate one type of benign neoplasm from another or one type of malignant neoplasm from another. Roentgenograms

and pyelograms, alone, fall short of what is possible in the way of diagnosis when proper consideration is given to additional data such as age, clinical findings, and numerical probability.

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## RADIATION THERAPY OF TUMORS OF THE GENITO-URINARY TRACT<sup>1</sup>

By U. V. PORTMANN, M.D., Cleveland Clinic, CLEVELAND, OHIO

I AM purposely confining my remarks to carcinoma of the bladder, since it is well known that if neoplasms in other parts of the genito-urinary tract are diagnosed early enough, surgical removal will give a comparatively high incidence of cures. There are, of course, certain malignant tumors of the kidney which are so far advanced that radiation is the only possible method of treatment, and in these cases the ultimate outcome cannot compare with surgical treatment, since we are dealing with an entirely different group of patients. Always in malignant neoplasms of the kidney or the ureter the tumors are comparatively localized and there is a considerable interval before they break through into the surrounding structures. Until they have broken through, the operative procedure may extirpate them completely, except possibly in the case of hypernephromata, when the tumors have extended into the renal veins and caused early embolic metastases in the lung or bones. A case suspected of being this type of tumor should certainly have a thorough radiological investigation of the chest and bones before operative procedure.

A true carcinoma of the kidney is a comparatively rare condition and is sometimes cured by surgery, but most of these cases come to radiation either primarily or post-operatively, since recurrences are rather common. I recall one case of true carcinoma of the kidney in a child about eight years of age that I was able to keep alive and comfortable for more than three years in spite of wide abdominal extension of the disease and pulmonary metastasis. In this case it was possible almost to complete a cure, but the disease recurred until the patient died.

The papillomatous growths in the kidney are of considerable interest to the radiologist because they are so apt to cause transplants in the bladder, and I believe that the kidney should always be investigated in cases of papillomatous growths in the bladder.

Papillary neoplasms in the urinary bladder are the most common form of neoplastic growth. Almost all neoplasms of the bladder may be found to have papillary types of growth, so that statistical studies in any clinic would lead us to believe that carcinoma of the bladder other than papillomatous, is almost as common as papillary carcinoma. As a matter of fact, it may be stated that epidermoid tumors of the bladder are quite rare, usually developing on leukoplakias, and that the papillary carcinomas are vastly in the majority.

For a time I was somewhat confused in studying the clinical results of the treatment of bladder carcinomata, because I was of the opinion that I was dealing with at least two different types of neoplasms. I found that certain bladder neoplasms responded rather favorably to roentgen therapy, while on others I was unable to make any impression whatever. I was thinking of papillary carcinoma and squamous-cell carcinoma, but in the light of further studies I find that the latter type does not exist except as an epidermoid tumor with pearl formation, but that in all probability the true papillary carcinoma is comparatively radiosensitive, while the same type of growth which has existed longer or developed more rapidly becomes less differentiated and therefore less radiosensitive. This type of tumor the surgeons call the infiltrating type. Even in this type, a papillary formation does exist to some degree.

When there exist papillary tumors which are fungating and developing with fair

<sup>1</sup>Read before the Radiological Society of North America at the Fifteenth Annual Meeting, at Toronto, Dec. 2 to 6, 1929.



rapidity, and have a good blood supply, I think they will almost completely disappear by roentgen therapy alone, though, of course, never being permanently cured. I have also found that I get a better final result if I plan to give two or even three courses of treatment at suitable intervals. It is probable that one case in ten will come within this group. It is true, of course, that what the urologist calls papillary carcinoma from cystoscopic examination may not always be malignant, and that some papillary growths within the bladder may be treated successfully by less drastic procedures, and sometimes they will disappear spontaneously. However, it is probable that an experienced cystoscopist can determine malignancy in a fairly large percentage of cases from his examination and clinical evidence. It is often necessary for the radiologist to treat these cases without the advantage of a biopsy, but I feel that if we can relieve the patient of his symptoms, we have accomplished sufficient without the self-satisfaction of knowing exactly what we have treated.

Some time ago in reviewing my cases of neoplasms of the bladder, I found that though I did not obtain absolute cures, the patients were very greatly relieved and their economic status was improved. This was shown by the fact that a case not treated by any procedures lived miserably about nine months, while patients of the same type, who were considered to be beyond hope of any palliation, when treated by radiation lived very much more comfortably for an average

of eighteen months, thus showing that some bladder tumors are radiosensitive, and that it is worthwhile to treat every case.

The radiosensitivity of bladder tumors will depend upon their degree of differentiation—the less differentiated types will require very large doses to accomplish any benefit. These cannot be administered by roentgen ray alone, but require the combination of radium therapy and roentgen therapy, and this, of course, is a surgical procedure. It is probable that operation alone can cure only those cases in which the growth is entirely and completely localized, or in which a complete cystectomy has been performed. Necessarily there is a very high mortality rate from such a procedure.

When I first began to treat bladder tumors by deep therapy, I was very much discouraged, because most of the cases that were referred to me were sent because of recurrence following operation. In the light of my present view of bladder neoplasms, good results could not have been expected, because the surgical procedure in itself would have changed the entire situation so far as the blood supply was concerned, as well as probably changing the characteristics of the growth, so that it became less differentiated. I believe that if we will look upon bladder malignancies as all being of the papillary type, with greater or less differentiation, except an occasional case of epidermoid carcinoma, and plan our therapeutic procedures according to the type of papillary formation, we will be very much better satisfied with the results of our treatment.

## CLINICAL ASPECTS OF GENITO-URINARY TUMORS<sup>1</sup>

By W. E. LOWER, M.D., Cleveland Clinic, CLEVELAND, OHIO

**A**LLURING as would be a complete discussion of the many clinical aspects of tumors of the urinary tract—symptoms, indications for treatment, methods of diagnosis, etc.—the time at my disposal will permit of a discussion of only some of the diagnostic methods and the treatment employed in cases of tumors of the urinary tract, together with a report of such end-results as are now available. I wish, however, to express the deep sense of obligation which is felt by every urologist to the radiologists who are making possible a progressively increasing percentage of correct pre-operative diagnoses of tumors of the urinary tract, and who are constantly studying methods for the application of radiation in their treatment, with a progressively increasing percentage of cures.

The diagnosis of bladder tumors is not as a rule difficult with the aid of the cystoscope, but the type of tumor is occasionally difficult to interpret from inspection. The majority of tumors in the bladder are papillomata and carcinomata of various types. Occasionally it is difficult to differentiate tumors of the so-called inflammatory type from those which are the truly malignant. A series of such cases has been reported by Dr. J. J. Joelson and myself (*Surgery, Gynecology and Obstetrics*, October, 1927, XLV, 417-422). The majority of inflammatory tumors of the bladder are tuberculomata. Occasionally the bladder is so irritable or so contracted that inspection with the cystoscope is not possible. In such a case cystograms will generally help to establish the diagnosis. This phase of the subject will be discussed by Dr. B. H. Nichols.<sup>2</sup>

Practically all tumors of the bladder are

potentially malignant because they all have a tendency to recur. The cardinal symptom is hemorrhage; and whenever there is blood in the urine, the possibility of a bladder tumor must be considered.

In contrast to the diagnosis of tumors of the bladder, the cystoscope is of limited aid in the diagnosis of tumors of the upper urinary tract. Here we must depend to a large degree upon the X-ray to help us out. The tumor most frequently found in the pelvis of the kidney is the malignant papilloma. A tumor of this type as a rule produces but little enlargement of the kidney unless hydronephrosis is present, so that palpation is of no aid in making the diagnosis, which can be determined only by a proper interpretation of the pyelograms.

In the case of the solid tumors of the kidney, tumors involving the cortex, diagnosis is more easily made, since the enlarged kidney is generally palpable. Often a tumor of this type can be diagnosed without the aid of either the cystoscope or the X-ray. It is well known that any large solid tumor palpable in a child's abdomen is probably a malignant tumor of the kidney. It is my impression that in cases of kidney tumor in children, hemorrhage is less frequently encountered than in cases of tumor of the kidney in adults.

In determining the source of bleeding in a case of hematuria, the possibility must be borne in mind that there may be a tumor situated in the lower end of the ureter. In a case of this type the cystoscopic observation will often show the bleeding to be coming from the ureter, but when the catheter is passed up the ureter for a considerable distance, the urine will come clear.

When papillomata of the bladder are not too large and are not situated too near the internal sphincter of the bladder, the proper

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<sup>2</sup>See page 547.

treatment is by fulguration. If the tumors are very large, or are multiple, as sometimes happens, so that the entire bladder is filled with tumor masses, it is better to open the bladder and cauterize the tumors from above. I have found the most satisfactory method of cauterization to be by the use of a soldering iron. In some cases, after searing over almost the entire bladder with this soldering iron, I have been amazed to find that the tumors have entirely disappeared, and that within a very short period the bladder mucosa has become healed.

Bladder tumors of the histologically malignant type present a somewhat different problem, for these tumors metastasize to the adjacent lymph glands, or may produce a metastasis at some distant point. I have had one case in which a metastasis from a bladder tumor appeared in the brain. This was reported by Dr. R. M. Watkins and myself in the *American Journal of the Medical Sciences* (March, 1924, CLXVII, 434).

When the tumor, even though malignant, is not of the infiltrating type, wide resection of the bladder is still, in all probability, the best procedure, but for the infiltrating type of tumor I think there is no doubt that radiation has displaced operation as the preferred method of treatment. For this, the following reasons exist: (1) the immediate mortality rate is lower; (2) the prolongation of life is probably greater; (3) the economic result is probably better. This conviction is the outcome of a study of the end-results in our own series of cases of tumors of the bladder consisting of 523 cases, 182 of which were benign and 341 malignant tumors. Between 20 and 23 per cent of the histologically malignant cases treated surgically are known to have survived over the five-year period, and in some cases there has been no recurrence for as long as twenty years. It is still too soon to know what the results of treatment by radi-

ation alone are going to be. Dr. Portmann will analyze the data at hand later in this symposium.<sup>3</sup>

Papillomatous tumors are easily transplanted and great care must be taken in their removal by the open method, or the cells may be transplanted into a cut surface and a tumor will develop in the scar. A frequent re-check of all cases of papillomatous tumors of the bladder is essential, as they so often recur. The reason for the recurrence probably is that the removal of the tumor does not remove the cause which produces it, and the conditions which produce the first tumor may be present to start the growth of other tumors.

Primary tumors of the ureter are quite rare. We have had one case. Secondary involvement of the ureter, especially of its lower end, is of more frequent occurrence. This is usually papillomatous in character and is due to a transplant from a papilloma of the kidney pelvis. The question as to whether or not the entire ureter should be removed in cases of tumor of the kidney pelvis must be considered. A section across the ureter at the upper end may show that the ureter is perfectly smooth and uninvolved, but later a hemorrhage may occur, due to a transplant at the lower end of the ureter, the cells having been washed down with the urine and accumulated like driftwood just behind the uretero-vesical junction. If there is some contra-indication to the removal of the ureter at the time of the kidney operation, it should be borne in mind that the ureter is still *in situ* and may perhaps be removed at a second operation.

Tumors of the kidney, other than cysts and hydronephroses, are nearly always malignant. There are a few benign tumors which grossly simulate malignancy, namely, the lipomata, leiomyomata, and myxomata. Our cases of malignant tumors of the kidney are 115 in number; 19 per cent of these

<sup>3</sup>See page 542.

patients have survived operation for over five years, one patient has survived for fifteen years, and one for twenty-five years. We are still undecided as to whether or not these tumors should be removed primarily and then treated with X-ray, or be given a course of X-ray first and then removed. I think this depends somewhat upon the size of the tumor and the amount of fixation. I have seen one case in which the tumor, which was extremely large and fixed, be-

came definitely smaller and movable by the use of radiation.

Malignant tumors of the urinary tract still present the most difficult problem in genito-urinary surgery. I have a growing conviction that in the future radiation, or a combination of radiation and surgery, will be employed more often than has been the case in the past. Here, as in the case of tumors elsewhere, early recognition and early treatment will give the best results.

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## TUMORS OF THE URINARY TRACT<sup>1</sup>

By B. H. NICHOLS, M.D., Cleveland Clinic, CLEVELAND, OHIO

**W**HEN a patient presents himself for examination because of frequency and blood in the urine, cystoscopic examination may reveal a large or small tumor in the bladder. There are cases, however, in which the cystoscope can not be introduced into the bladder, and also some cases in which a clear field can not be maintained in the bladder on account of persistent hemorrhage.

In the latter case, cystography offers a very easy method of determining the presence of filling defects, provided the tumor present is so large as not to be overshadowed by the remaining portion of the bladder. Tumors of the bladder are best observed by fluoroscopic cystography, as a small amount of solution in the bladder may outline the filling defect, while if the bladder is distended with fluid, the filling defect can not be seen. Films should be made obliquely in both positions as well as antero-posteriorly.

Kohnstam and Cave also outline a unique method of observing tumors of the floor of the bladder. The bladder is filled with a non-opaque solution, a small amount of which is then withdrawn, and lipiodol or iodized oil is floated on the remaining fluid. Then by placing the patient in the Trendelenburg position, the floor of the bladder can be well outlined and the presence of a filling defect can be determined. This method is particularly applicable also in the study of tumors of the prostate gland.

Extensive blood clots in the bladder are sometimes mistaken for filling defects due to the presence of a tumor. Enlargement of the prostate also will make a filling defect in the floor of the bladder. This should not be mistaken for a tumor, however, if it is remembered that the prostate is usually regu-

lar and smooth in outline, while tumors are irregular and asymmetrical in outline.

Tumors of the ureter are generally of the papillomatous type and are usually transplants from a primary tumor of the kidney. They are very difficult to diagnose by the use of the ureterogram alone as stricture and other deformities produced by infection may closely simulate a tumor. A diagnosis of a primary ureteral tumor can be made only by the use of cystoscopy, by close observation of the clinical symptoms, and by the finding of an irregular filling defect in the ureteral lumen.

Tumors of the kidney are usually suspected when a palpable mass is found in the region of the kidney, or when pain, accompanied by marked hematuria, is present. These symptoms, however, may not necessarily be present. It is a fairly accurate estimate that only about 50 per cent of tumors of the kidney are accompanied by hemorrhage. Tumors unaccompanied by hemorrhage are usually of the hypernephroid type. In the diagnosis of tumors of the kidney in the absence of clinical signs or symptoms, a roentgenological examination is indispensable. In the case of a palpable mass in the kidney region, suspicion that the mass is due to the presence of a tumor may often be confirmed by a stereoscopic examination of the kidney region, as tumors of this type are usually confined to the pole of the kidney and show an enlargement of the kidney outline at the site of the tumor.

Pyelography has been found to be the best method of procedure for the diagnosis of tumors of the kidney, a method which fails only when the tumor is confined to the capsule or cortex or when there is present in the kidney pelvis a very small tumor of the papillary type, the shadow of which may be completely lost in that of the pyelo-

<sup>1</sup>Read before the Radiological Society of North America at the Fifteenth Annual Meeting, at Toronto, Dec. 2 to 6, 1929.

graphic medium. In the latter case a pyelogram made after the injection of air will disclose a small tumor of the pelvis, but we have hesitated to inject air into the kidney pelvis if hemorrhage has occurred, on account of the possibility of an air embolism. However, there is probably little danger in the procedure. All other types of tumors may usually be detected by the irregularity of outline, elongation or obliteration of the calices or pelvis. Tumors at the lower pole of the kidney may displace the ureter or obstruct it, with resultant dilatation. Benign tumors of the kidney usually show a smooth, regularly outlined deformity of one or more calices, with displacement or compression. Such deformities may also extend to the kidney pelvis, depending upon the size and location of the growth.

This would seem to be a simple method for the diagnosis of benign growths of the kidney. However, there is a large group of malignant tumors of the hypernephroid type, many of which are definitely encapsulated, and produce a clean-cut deformity of the pelvis or calices, and for this reason are not always recognized as malignant tumors.

Most malignant tumors of the kidney, except those of the hypernephroid type, produce an irregular filling defect indicating invasion of the kidney structure, and in any case, therefore, such findings lead to the suspicion that the tumor is malignant. It must be understood that pyelographic findings are limited to the recognition of the presence of a tumor. In only a fair percentage of cases can the pyelogram provide sufficient evidence for the differentiation between a malignant and a benign tumor. Metastases of the hypernephroid group to bones or the chest are characteristic round nodules, and will establish the type of kidney tumor if they are present.

The differential diagnosis of tumors of the kidney consists in the recognition of anomalous pelvises, of a polycystic kidney,

and of the presence of infection or of an ureteral obstruction, with resultant hydronephrosis.

Hydronephrosis in the presence of a tumor may be due either to the actual obstruction of a calyx or of the ureter by the tumor, or to a simple compression of the ureter, in which case the dilatation will be proximal to the point of obstruction. When a tumor is accompanied by hemorrhage, the presence of blood clots may produce obstruction of the ureter, with resultant hydronephrosis, which is usually accompanied by deformity of a portion of the pelvis or calyx, and may be differentiated from a general dilatation from other causes by the asymmetry of the pyelographic shadow. A hydrocalyx may be the exception, but if the entire pelvis is outlined, or if a calculus is found in a calyx, the presence of a tumor can be ruled out. Infection will seldom simulate a neoplasm. Pyelitis produces a characteristic clubbing of the calyx, and pyonephrosis produces destruction and fragmentation of the pelvis, the entire kidney usually being involved. Infection may accompany a tumor and make the diagnosis difficult. If a deformity of the pelvis is due to blood clots, this may be determined by repeated examinations, or by making a pyelogram after the pelvis has been washed out.

Congenital polycystic kidneys perhaps offer the most difficult problem in differential diagnosis, as elongation of the calices and deformity of the kidney outline by the cystic areas may present a picture closely simulating that presented by a kidney tumor. However, in the case of a cystic kidney a pyelogram of the opposite side will usually reveal the condition to be bilateral, while in the case of a tumor the condition is confined to only one kidney.

In making my contribution to this symposium, it has been my intention not to enter into a discussion of the pathology or the

symptomatology of tumors of the urinary tract. I will leave this to my colleagues.

## DISCUSSION

DR. G. E. PFAHLER (Philadelphia). First of all, I am somewhat surprised, after all these excellent procedures have been described, that no mention has been made of the examination of tumors of the bladder by pneumocystography. One can very clearly outline practically any tumor of the bladder by this very simple procedure, the means of which are in every physician's, every radiologist's, hands. The procedure has been used by me since 1911, and I described it in 1916. It consists simply of the introduction of a soft rubber catheter, an atomizer bulb to distend the bladder with air, and then clamping the catheter with forceps and making the film, first with the patient lying supine and then in the prone position. The prone position always gives the better film, but sometimes in rolling the patient over you may lose your air. Sometimes this occurs because the catheter is expelled, but that is not necessary, because if you exercise care the catheter will not come out. The catheter can be held in place by the fingers while the patient rolls over.

These tumors may be very large, and they may show involvement of the bladder wall; if the bladder wall is infiltrated, it cannot expand. Now this is not only of definite advantage in outlining and determining the location and size of the tumor but it serves as a very excellent guide to the radiologist in determining to what extent the tumor is decreasing under radiation, and whether it is cured completely. I agree with Dr. Portmann that the radiation treatment is very useful in the treatment of these bladder tumors.

A MEMBER: I think this Symposium has been exceptionally well arranged, because we have the combination of a pathological,

a diagnostic, and a therapeutic paper on the subject of tumors of the urinary tract. We must remember that they are all dealing with pathology, and we must all understand pathology before we can attempt the reading of the graphic portrayal of the diagrams. This is the way we should always arrange subjects of an unusual character.

The relation of the blood channels in hypernephroma to the actively growing tumor cells is particularly interesting. We know that these blood channels have exceedingly thin walls, in some instances no more than the single layer of epithelium making up the blood channel.

We know how intimate is the relation in the normal lung between the lymphatics and the epithelium, and how easy it is for cells to go through that very thin tissue.

Dr. Pfahler's remarks I think fit in very well with the Symposium, and it is a part of the subject which should be thoroughly well understood. The procedure of introduction of air into the bladder, in cases of tumors of the bladder, is not without a certain amount of risk. All urologists realize that there is a very definite rate of mortality connected with this procedure and that it must be done with due regard to that mortality, and with great care.

There is, of course, another way of making the examination—by the introduction of opaque substances, such as sodium iodide, into the bladder. But my experience has been, as Dr. Pfahler's, that you get a little more information by the introduction of air than you do by the use of opaque solutions. But do not forget to proceed with great discretion in the introduction of air into the bladder.

DR. SAMUEL BROWN (Cincinnati, Ohio): I take exception to one reference in the excellent paper by Dr. Lower. If X-rays are good in inoperable cases, why are they not good in operable cases? I get better results

in certain cases than in others, and I attribute the good results to the fact that those patients did not get the benefit of the knife. Those who were operated on did not do as well; those who were not operated on seemed to do better. I think that the knife often spoils the field for X-ray treatment.

DR. GRAHAM (closing): A subject has been brought up into which I did not go as far as I would have liked to do—about the invasion of blood vessels—and it may

explain some of the unexpected metastases. A tumor which is encapsulated, irrespective of whether it is carcinoma or sarcoma, shows little tendency to dissemination so long as it is within its own capsule. It may disseminate through the blood stream because of the relation of the tumor cells to the blood stream. But any tumor which breaks through the capsule has, then, two routes of dissemination: by reason of its original relationships it may go through the blood stream, and by reason of the lesion it has access to the blood stream.

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## SPONDYLITIS TRAUMATICA TARDA (KUMMELL'S DISEASE)<sup>1</sup>

By EDWARD S. BLAINE, M.D., F.C.R.S., CHICAGO, ILLINOIS

Associate Professor of Roentgenology, Northwestern University Medical School;  
Roentgenologist to Wesley Memorial Hospital, Frances E. Willard Hospital;  
Consulting Roentgenologist to Cook County Hospital

THE name "Kummell's disease" has been given to a specific X-ray and symptom complex first described by Kummell in 1891 (1). Other terms include appropriate and descriptive phrases which indicate the pathologic change, the causative factor, and the characteristic delay of symptoms, namely, "post-traumatic spondylitis," "spondylitis traumatica tarda," and "post-traumatic vertebral collapse."

Attention is being directed to this peculiar condition by medical writers and investigators with increasing frequency in Germany, France, and in America, which may be construed as evidence that the lesion is not so rare as some surgeons and roentgenologists believe it to be. However, it is safe to say that it is an uncommon condition and that it occurs so seldom that many busy roentgenologists have never encountered a typical case, or, at least, never have been confronted with the chain of events which characterize Kummell's disease.

An X-ray study of this condition reveals varying degrees of loss of bone substance of a vertebral body at different periods of time following causative injuries which range from the seemingly inconsequential to trauma of major proportions but without actual gross compression fracture. The typical case presents an unmistakable clinical and roentgenological complex, while the atypical ones are less easily recognized and consequently are frequently overlooked. It is my opinion that there is a considerable number of unrecognized cases of Kummell's disease, a belief which I base on the fact that I am discovering the characteristic X-ray shadow

evidence of a partial collapse of a vertebral body without history of fracture when searching for X-ray evidence of non-traumatic conditions. This has come about, in part at least, by the adoption of an exposure technic in my laboratories of lateral films in all routine chest examinations, of lateral views of all gastro-intestinal examinations, as well as the usual lateral projections of all spine cases such as are now a routine procedure in all modern X-ray laboratories staffed by skillful roentgenologists. On a few of these lateral projections I have found the typical shadows of vertebral bone changes which characterize the condition under consideration. Most of these are symptomless and the patient is not aware that one of the spinal bones is partially collapsed.

This lesion was first described by Hermann Kummell, in 1891, followed by subsequent writings since that time, and his name is usually cited in referring to the condition. A not inconsiderable literature on the subject has accumulated, among the writers who have contributed being Bahr (2), Bäumler (3), v. Bechterew (4), Berkhoff (5), Duclaux (6), Ewald (7), George and Leonard (8), Hagemann (9), Jones (10), Kocher (11), Köhler (12), Nonne (13), Rossi (14), Schlatter (15), Steindler (16), Verneuil (17), and Zamboni (18). In 1891, Prof. Hermann Kummell (1), of Hamburg, presented his noteworthy work on a new condition which he called "die rarefizierende ostitis der wirbelkörper" (rarefying osteitis of a vertebra). He described the lesion as of traumatic origin, such as a blow on the shoulders or back or the neck, or on top of the head, with a resulting pressure or squeezing of one of the

<sup>1</sup>Read before the Radiological Society of North America, at the Fifteenth Annual Meeting, at Toronto, Dec. 2-6, 1929.

mid-vertebrae but with no gross fracture. The injured individual does not experience local pain in the back at the time. After two to three days he begins to complain of back pain, which sooner or later disappears for a time, again to return months (or perhaps years) later. At this late day the condition appears to develop as a neurological problem, with complaints of pain extending from the back along the intercostal nerves or down the lower limbs, depending on the level of the involved vertebrae. An X-ray study now discloses an unsuspected partially collapsed vertebra. Kummell called attention to the occurrence of relatively slight force in the production of the lesion in many of the cases that he reported, a trauma that under ordinary circumstances would not result in fracture of such a bone as a vertebral body. In 1921, thirty years after his original thesis, Kummell (19) reviewed the subject *in extenso*, changing the terminology to "Die post traumatische Wirbelerkrankung," or "post-traumatic disease of a vertebra."

Three stages of the development of the lesion may be described, as follows: first, the occurrence of the injury, often of minor degree, with no evidence, X-ray or otherwise, of a fractured vertebra, with relatively little pain for a short time; second, a period of normalcy with no complaint of pain, etc., and third, usually after several weeks, sometimes after several months, though occasionally after several years, the gradual development of back pain and, in a few cases, a moderate prominence on the spine. An X-ray study at this time discloses an altered vertebra, the body of which is decreased in volume, in other words, is partially collapsed. Schede (20), in 1912, referred to a similar condition and considered it as a slowly developing bone change—the result of an unrecognized fracture, with a resulting gibbus, but Kummell believes that no actual or true bone fracture occurred at the initial injury. He regards it as an in-

jury, possibly microscopic in extent, to the trophic factors, which are so affected that they no longer can function in a normal manner, and as a result the bone tissue becomes more or less devitalized and unable longer to withstand the pressures incident to normal postures. The most frequently involved vertebrae are those from the fourth to the seventh dorsal, but the lesion has also been found in the lower dorsal and the upper lumbar bones, and Colcher (21) has reported one of a sixth cervical vertebra.

The principal feature in the discovery of a case of spondylitis traumatica tarda is the finding roentgenologically of a more or less collapsed vertebral body, often without kyphos or knuckle, it may be incident to an examination for non-traumatic lesions. There is often no recollection on the patient's part of a severe back injury, but in other cases there is a history of such an event several months to several years previously, often not of enough severity to have put the patient to bed or call for more than casual medical attention. Such injuries consist of a more or less severe squeezing force to the upper and lower parts of the patient's body in hyperflexion. The bone collapse was not present immediately after the injury, as shown on X-ray examination at the time, or, in the absence of such X-ray examination, as based on the absence of clinical evidence of a fractured vertebra.

Many patients who have this lesion do not know that they have actual bone change, while other individuals think of themselves as having lumbago, or the like. Many do not have any symptoms referable to the collapsed vertebra at all, and go through life without ever being inconvenienced by it or knowing of its presence. The symptomless cases of collapsed vertebra are discovered during X-ray examination for some condition not associated with the spine, such as investigation of the urinary tract or the chest for respiratory or heart disease.

The particular cause of the changes which

characterize this lesion appears to be a trauma to the trophic supply of an individual vertebra by which this vitally necessary mechanism is prevented from functioning, thereby disturbing the normal process in maintaining the integrity of an individual bone. In other words, the constantly present process of wear and repair which is normal throughout our physical bodies, is literally put out of commission at a local point, in this instance a single vertebra. This, then, is followed by the absorption of devitalized bone cells in greater or lesser amount, in accordance with the amount of trophic injury incurred. Lacking the repair process, an absorption of the devitalized bone takes place, the volume of the bone decreases, and the result is a lessening in the size (volume) of the body of the involved vertebra. This we see on the X-ray film as shadows that represent a "settling" process, demonstrated by the decrease in height. The decrease in bone volume is greater anteriorly than posteriorly in some cases, not unlike the changes which occur in tuberculous spondylitis, and a similar gibbus results. However, in a few of the cases this decrease is fairly uniform throughout the body of the vertebra, the settling occurring evenly with no gibbus resulting. In certain cases of lumbar involvement there is only a flattening of the normal lumbar curve forward, while some dorsal cases show only an accentuation of the dorsal prominence. The normal support of the posterior processes—the articular facets, etc., of vertebral anatomy—retards the settling process, which accounts for the greater loss in the forward portions of the body in the cases in which a knuckle develops. The X-ray shadow outline of the involved vertebral body has changed from that of a fairly regular parallelogram to that of a truncated cone, which is graphically shown on the lateral X-ray projection in such cases. Incidentally, it is to be remarked that this lesion is seldom recognized on the antero-posterior X-ray projections, even on tech-

nically perfect films, but after finding the lesion on the lateral projection it will be recognized and supported by shadows on the antero-posterior views, particularly on stereoscopic visualization. The distortion incident to all X-ray projection has to be considered in analyzing the shadows of the bones of the spine which fall near the upper and lower edges of the 14x17 films, which usually are used in routine spine examinations since the advent of the Potter moving grid. Those bones farthest away from the central point of exposure will show a considerably greater degree of distortion, due to the increasingly divergent rays, and may offer difficulties in interpretation. If lateral projections are not a routine procedure, one will miss the lesion under discussion. It is the lateral projection on which we must place our dependence in the search for Kummell's disease. The use of the Potter grid makes successful lateral exposures of the spine easily possible, and this examination is now a much less formidable operation than formerly.

Pathological studies of this lesion are reported by Ludloff (22) as showing the presence of numerous small hematomas in the spongiosa of the involved vertebral body, with rarefaction of the bone tissue seen in the moderately advanced cases, while in late cases there is a complete breakdown of the bone structure. Microscopic studies by another observer have been reported in a case which showed an intervertebral disc, associated with the involved bone, also to have undergone a similar process of nutritive starvation through traumatic obliteration of the blood vessel and trophic supply. This was recorded on the X-ray film by a decreased intervertebral space. In a few cases, it appears that one intervertebral disc only is involved, no bone collapse having occurred, but in such instances the symptoms are more vague and there is consequently a paucity of premises on which to base a conclusion. In

this form the intervertebral disc decreases, permitting the two apposing bones to approach each other, yet the space does not entirely disappear as it does in high grade inflammations. In one case observed by the writer such an inflammation appears to have occurred as a complication or sequel to the development of Kummell's vertebral collapse.

A striking feature of post-traumatic spondylitis tarda is the surprisingly small degree of disability that results in most cases. In fact, if true disability were to occur, I would question whether it were a case of Kummell's disease. Steindler (16), in his recent work on the spine, states that the prognosis in "Kummell's kyphosis," as he terms it, is usually good, and that permanent disability is rare, a partial disability of from 10 to 15 per cent being most frequent.

As has been previously stated, a careful study of X-ray films of good technical quality shows normal vertebral bones immediately after the injury which later develops into a Kummell's disease. It is evident, therefore, that this condition is not a fracture of a vertebra in the ordinary sense. Whether or not microscopical compression is the initial lesion remains a question, but obviously the X-ray cannot demonstrate such an occurrence. George and Leonard (8), in their book on the spine, differ with Kummell as to the absence of initial fracture, believing it to be definitely a compression fracture, overlooked on the X-ray film after injury. I am inclined to this hypothesis, but consider it a microscopic rather than a macroscopic solution of continuity of bone structure, with trophic injury and subsequent degeneration of bone substance, absorption, and collapse. One discussant recently submitted the hypothesis that Kummell's collapse does not occur unless the bone is already diseased at the time of injury, suggesting that a latent focus of infection was a prime factor.

The principal lesion to be differentiated

from Kummell's disease is spondylitis tuberculosa. In this condition there is suppuration, necrosis, and much more absorption of bone tissue than is usual in Kummell's disease, the gibbus is invariably much more pronounced, and the condition is vastly more painful. In fact, many cases of Kummell's disease do not develop a knuckle, the loss being more even throughout the bone, which results in a more even settling.

In spondylosa rhizomelica there is a general settling of all of the vertebral bodies, resulting in a decrease in height more marked anteriorly, but this is not confined to one bone as is the case in Kummell's disease.

In the post-typhoid spine there is some loss of bone substance, but usually a hypertrophic change of repair takes place, covering the local decrease. In some of these cases an intervertebral disc may be involved—and destroyed, permitting direct apposition and fusion of neighboring bones.

In malignancy of the spine there is a local disappearance of bone density, but a shell-like outline of a vertebral body tends to remain and retain its usual size until it collapses from the superimposed weight of the upper body. In metastatic malignancy there are multiple small rounded areas of bone disappearance such as are never seen in Kummell's disease.

In syphilis of the spinal bones there is an increase of bone and periosteum, the opposite of the change seen in the condition under consideration. In Charcot's spine there is very marked disintegration of bone, while usually more than one bone is involved, resulting in an intermixture of the pathologic and normal quite unlike the localized and more clear-cut shadows seen in Kummell's disease.

In osteomalacia the changes are not confined to one bone of the spine, but are found in all the skeletal structures—a uniformly diffuse change.



## CASE REPORTS

The first case of this condition that came to the writer's attention was that of H. W., a member of his family, a woman 60 years of age who had experienced periods of low back pain for many years, although she made no complaint of the matter. The pain and discomfort were noticed immediately after changing the body position, following a period of rest or inactivity, notably on rising in the morning. After moving about, the back pain usually disappeared during the day. Bending the spine was not painful but was attended with some degree of discomfort, so that there was evident some limitation of flexibility, which, however, was more voluntary than actually restricted. She was not greatly concerned about the matter, only casually asking me if the X-ray would show the reason that her "back was sore at times." Upon making X-ray films of the lumbar spine I found a very marked settling of the body of the second vertebra. There was no spreading of the bone, no callus repair, or other evidence of fracture. There was only a decrease in the height of this particular bone, the others being normal; the cancellous bone architecture was lost. On going back over her history, I found that some thirty or thirty-five years previously, in the era of horse car transportation, while she was about to board a street car, as she raised her foot to step up into the body of the car from the rear platform, the horses lurched into their collars in getting the car started into motion. The sudden start caught her off-balance on one leg and she sat down suddenly with a jolt. She was assisted to arise and helped to a seat by the conductor. Aside from the jarring which she received she did not notice much discomfort, proceeded to her intended tasks, and later in the day returned home. Her back was sore but this disappeared after several days. After a considerable period of normalcy (several weeks), the pain returned. This became so



Fig. 1. Case 2. Unmistakable X-ray evidence of a collapsed first lumbar vertebra which must have antedated the recent injury by a considerable period of time, probably years.

bad that she remained in bed for about a week, albeit without medical attention. Following this, the pain gradually disappeared and she resumed the normal routine of a school teacher's duties. For several years all seemed well, but a gradually increasing discomfort in the lumbar region was noted, particularly on arising each morning. While it never left her entirely, it did not bother her particularly, probably through her having become accustomed to it, but there occurred periods when it was more marked than others. My X-ray examination of her lower spine showed the second lumbar body to have decreased in height approximately one-half the normal size. It was an even



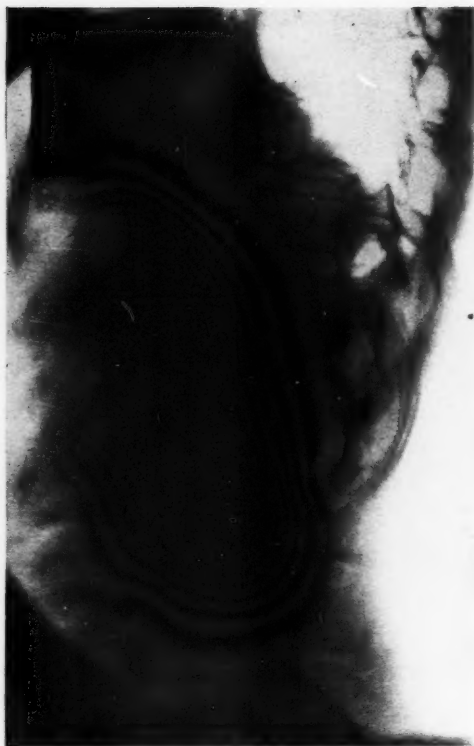


Fig. 2. Case 3. No shadows of callus formation are seen in any part of the dorsolumbar spine. . . . From the X-ray standpoint the features are quite those of a Kummell's disease.

settling, all portions of the body being equally involved. Thus there was no triangulation of the vertebral body such as has been found in many of the reported cases. The condition continued, with remissions as before, until her death from nephritis.

Another case (No. 2) is that of a patient (Fig. 1), W. B., male, white, age 26, 137 pounds in weight, who came to Wesley Memorial Hospital on Dr. Paul Magnuson's service, complaining of pain in his back, which extended down the back of both thighs. He stated that several weeks previously he had fallen down an iron stairway. He found it a little difficult to straighten up when he regained his footing, because of bruises and muscle soreness in his back, but walked home unaided. Application of a hot

water bag relieved the moderate pain so that he could resume his work the next day. After some time the discomfort and soreness in his back bothered him and he wanted something done to relieve it. After a study of the case a tentative diagnosis of severe wrenching of the back, with possible injury to the sacroiliac joints, was made. An X-ray investigation showed no evidences of a recent injury such as fracture or dislocation, but did show evidence of an old change in the body of the first lumbar vertebra. This was seen as a considerable decrease in the volume of the bone, its height being noticeably less than that of the neighboring bones, with a slight truncation but no angulation or gibbus. In view of his occupation, that of a laborer, it seems proper to consider this as an old, hitherto unrecognized case of Kummell's disease disclosed by the X-ray evidence. The man never has had a back injury severe enough to require surgical attention, has never been confined to bed for back trouble, yet there is unmistakable X-ray evidence of a collapsed first lumbar vertebra which must have antedated the recent injury by a considerable period of time, probably years.

A third case (Fig. 2) is that of A. B., white, male, 52 years of age, who came to Frances Willard Hospital, referred by Dr. A. F. Stewart. He complained of low back pain. Six months previously this patient had been in an automobile accident, the car turning over. He was knocked unconscious and "came to" in a doctor's office. He had been struck over the head in the temporal region and the skin over the lumbar region was bruised. After restoratives had been administered and dressings applied to the bruised parts he walked out of the doctor's office, was taken home and put to bed, remaining there for four days. He felt weak but could walk without much difficulty and had no pain except a little in the lumbar region, which gradually subsided and disappeared entirely in about two months' time.



Fig. 3. Case 4. X-ray study showed no evidence of bone fracture or dislocation but disclosed a typical alteration of the body of the sixth dorsal vertebra, which is materially smaller than the bones above and below it. The evidence was such that a report of Kummell's disease was made.



Fig. 4. Case 5. An X-ray examination of the spine disclosed the decrease in height of the first lumbar vertebra, indicating a collapse. The X-ray shadows are rather more like those in the ordinary compression fracture than is true of the usual post-traumatic case, but the fact that the symptoms did not manifest themselves until nearly three months after the injury seems to warrant its being classified as an atypical Kummell's disease.

He could then bend his back in any direction without pain. After about two months of normal ease, the pain in his back returned, from which he sought relief upon entering the hospital. (Incidentally, a lawsuit was in the offing.) An X-ray examination was made (September 28, 1928), with the following report: "The body of the first lumbar vertebra is collapsed to less than one-half its normal volume. It is evidently an old lesion. No signs of bone fracture are present. All other bones are normal. The shadows are consistent with a Kummell's disease." One consultant regarded the case as one of a compression fracture, so a second examination was made after an interval of three months (January 31, 1929), and reported as follows: "No shadows of callus formation are seen in any part of the dorso-lumbar spine. The 'settling' of the body of the first lumbar vertebra, reported on my

previous examination, is again manifested, the condition being substantially the same. From the X-ray standpoint the features are quite those of a Kummell's disease."

A fourth case (Fig. 3) is that of S. L., white, male, age 42, who was sent to me at the National Pathological Laboratories by Dr. Karl Meyer, complaining of pain in his back. This man had been in a fight some time previously, and he had twisted and strained his back in throwing his opponent. His back had been painful for two or three days but this left him and he went to work. Some time later he began to feel pain along his spine on movement in bending and in climbing stairs. His physical examination was negative. An X-ray study showed no evidence of bone fracture or dislocation, but disclosed a typical alteration of the body of



Fig. 5. Case 6. X-ray examination disclosed a lesion involving the twelfth dorsal and first lumbar vertebrae. The bodies of both of these bones were fused on their apposing surfaces, with a marked decrease in the height of only the twelfth dorsal.



Fig. 6. Case 7. This X-ray examination fails to reveal any evidence of recent bone or joint injuries but does disclose the presence of an old lesion of the eighth dorsal vertebra. This consists of a partially collapsed body of the bone and is definitely an old rather than a recent lesion.

the sixth dorsal vertebra, which was materially smaller than the bones above and below it. The evidence was such that a report of Kummell's disease was made. No X-ray examination had been made immediately after his injury, so that we do not know whether or not the lesion was present at that time, but if he had had a compression fracture it is highly improbable that he would have returned to his work with a "broken back."

Case 5 (Fig. 4). J. F., age 33, 145 pounds in weight, 5 feet 9 inches in height, entered Wesley Memorial Hospital on the service of Dr. H. M. Richter. On May 26, 1929, the patient fell about fifty feet, landing on his feet. The fall resulted in an injury to the left foot which, upon X-ray examination, was found to be a comminuted fracture of the os calcis. No complaint was

made by the patient of any particular trouble in his back, which, therefore, was not examined roentgenologically. Because of the foot injury he was confined to bed in the hospital for several weeks. At no time did he notice any pain in his back until five weeks after the injury, when he was allowed to be up and around. For the next few weeks he noticed some slight pain and rather marked numbness in the dorsolumbar region. This numbness occurred only when the patient was sitting down. Since its onset it has been becoming progressively worse. Because of this complaint of his back, an X-ray examination of the spine was made (August 10, 1929), three months after the injury, in order to satisfy the patient. This disclosed the decrease in height of the first lumbar vertebra, indicating a collapse. The

X-ray shadows are rather more like those in the ordinary compression fracture than is true of the usual post-traumatic case, but the fact that the symptoms did not manifest themselves until nearly three months after the injury seems to warrant its being classified as an atypical Kummell's disease, with actual fracture of slight degree as the initial injury, with subsequent progressive vertebral collapse.

Case 6 (Fig. 5). N. T., age 64, weight 165 pounds, 5 feet 5 inches in height, referred August 8, 1929, by Dr. Karl Meyer for an X-ray study of the gastro-intestinal tract. During this examination there was noted a lesion involving the twelfth dorsal and first lumbar vertebræ. The bodies of both of these bones were fused on their apposing surfaces, with a marked decrease in the height of only the twelfth dorsal. Upon questioning the patient he gave a history of a back strain at the age of 16. He said this injury resulted from heavy lifting and was of little consequence but that he did have mild pain in the back for a period of several weeks, not enough to cause him to consult a doctor. He did not recall any other incident which would point to an injury to the spine such as would produce the changes found. He has had no symptoms of spinal trouble since the incident of about fifty years previously. In this case the evidence denotes an accompanying injury to the intervertebral disc, which also underwent a softening process, with subsequent absorption and the probability of an inflammatory accompaniment in the cartilage.

Case 7 (Fig. 6). This patient, J. R., is a male, 23 years old, white, a carpenter by occupation. He was admitted to Wesley Memorial Hospital on Dr. Sumner Koch's service on March 1, 1929, having just been hit by a street car. He was considerably bruised over the hips and there was much loss of skin over the thighs and left knee. An X-ray examination failed to reveal any evidence of recent bone or joint injuries but did disclose



Fig. 7. Case 8. X-ray investigation of most of the bones of the body disclosed only one abnormal area, that of the twelfth dorsal vertebra, the body of which presented a typical truncation of a partially collapsed vertebra. The shadows did not have the appearance of a malignancy, nor did they present the usual shadows of a post-typhoid spine. The evidence was largely in favor of a Kummell's disease.

the presence of an old lesion of the eighth dorsal vertebra. This consisted of the partially collapsed body of the bone and was definitely an old rather than a recent lesion. An incomplete history as to any previous injuries was obtained, but it is obvious that no vertebral bone can undergo such a collapse without there being some cause. This might easily be some minor trauma that anyone who goes through our modern life hazards is liable to experience, without its focusing the attention of the individual to any particular event. One has but to recall the strains and stresses incurred by students at high school, college, etc., in playing foot-



Fig. 8. Case 10. The X-ray findings are a partial collapse of the body of the seventh dorsal vertebra. Although marked truncation is present, there is no gibbus or prominence over this level. This seems to be a typical case of Kummell's disease.

ball, etc., to appreciate the possibilities in this case.

Case 8 (Fig. 7). This patient, E. W., white, female, 54 years of age, 106 pounds in weight, was referred by Dr. Christian Hauch on March 29, 1929, for X-ray study of the spine. There was complaint of pain and tenderness over the lower dorsal area. Two years previously she had stumbled over a raised board in the sidewalk, and fallen, straining her back rather painfully but not severely enough to require rest in bed. After a time the pain disappeared only to return later. For the past year she had complained of varying degrees of pain in the mid-spine. As she had had one breast removed four and a half years previously and the other two

years later for malignancy, a metastasis to the spine was suspected as the cause of the pain of which complaint was made. She also had had typhoid fever some twenty-five to thirty-five years previously. An extended X-ray investigation of most of the bones of the body disclosed only one abnormal area, that of the twelfth dorsal vertebra, the body of which presented a typical truncation of a partially collapsed vertebra. The shadows did not have the appearance of a malignancy, nor did they present the usual shadows of a post-typhoid spine. The evidence was largely in favor of a Kummell's disease.

Case 9. Patient was J. Y., white, female, 28 years of age, 125 pounds in weight, referred by Dr. C. M. Jacobson on January 19, 1927, for X-ray examination of the lumbar spine and sacro-iliac joints. Her complaint was that of recurring periods of low back pain. For weeks at a time she was free from her trouble, but at times it became quite uncomfortable. It was most noticeable on arising in the morning. There was no history of a recent injury but eleven months previously, while being taken to a railway depot in a taxicab, the cab struck a hole in the pavement, and on the rebound she was bounced upwards, striking her head against the ceiling of the cab. The chauffeur immediately stopped and inquired the extent of her injury. She complained of her head hurting, but went on to the depot, making no mention of her back. She continued her journey, a three-hour train ride, during which time she had a good deal of headache. This continued for several days. Two or three weeks later she began to notice a sore spot in her back, but this did not bother her to any great extent. Later on, whenever she rode in an automobile or street car, she found that the pain in her back would return. The X-ray examination established the presence of a partially collapsed body of the first lumbar vertebra. There was moderate truncation of the bone but no gibbus or undue prominence. On this X-ray evidence and



the history, the findings are those of a traumatic spondylitis tarda.

Case 10 (Fig. 8). This patient was M. A., a female, 40 years of age, 135 pounds in weight, referred October 18, 1928, by Dr. R. W. McNealy to determine the cause of a pain between the shoulder blades. Five months previously, while riding in an automobile on a wet day, the car failed to make a turn and left the road, crashed through a retaining fence and rolled down a 20-foot embankment into a ditch. She was unconscious for a short period and "came to" standing on her feet supported by members of her party. Immediately after the injury her neck felt stiff but otherwise she made no complaints. Weeks later she began to notice some pain in the mid-dorsal region when on her feet, and for nearly a year she experienced pain in breathing on deep inspiration. This gradually subsided and since that time she has had no symptoms whatsoever. The X-ray findings (October 18, 1928) are a partial collapse of the body of the seventh dorsal vertebra. Although marked truncation is present, there is no gibbus or prominence over this level. This seems to be a typical case of Kummell's disease. A re-examination made by me on October 1, 1929, shows the condition to be exactly as at the previous one.

#### SUMMARY

Whatever the exact etiology may be, Kummell's disease, or complex, is a lesion that is of considerable importance to the industrial physician and surgeon and the roentgenologist.

There is some probability that the initial lesion is a minor degree of compression of a vertebral body, but careful X-ray examinations of the spine made immediately after injury show no fractures of the vertebra that on later X-ray study is found to be decreased in height, indicating a partial collapse.

There can be no doubt but that some cases, diagnosed as Kummell's disease, were simple compression fractures overlooked on X-ray examination or not roentgenographed at all.

There is a fairly constant sequence of events which characterizes this condition.

It is not a disabling disease and may be symptomless.

The X-ray is the only means by which its presence may be revealed.

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## DISCUSSION

DR. W. W. WASSON (Denver, Colo). In view of the hesitancy of the audience in discussing the papers, I would like to report a case. I do not wish to be placed in the position of reporting the impossible, but I do believe that it probably offers one or two points to Dr. Blaine's paper. In the spine we have many vertebrae. There are certain points in that spine where a force, when applied to the spine, gives the greatest trauma to the vertebra—certain crucial points. It is also reasonable to assume that all of the vertebrae will not have the same strength. This case that I wish to report illustrates that possibility. A parachute jumper left his plane at three thousand feet. He weighed one hundred and seventy-five pounds. He had a twenty-eight foot parachute. The parachute opened only three feet. According to calculations, this was sufficient to break the fall of only twenty-five pounds. We, therefore, have a one hundred and fifty pound man falling from a three thousand foot altitude. The man fought the rope all the way down. He lit on his toes. He was a professional parachute jumper, and knew what was going on at all times, even when he struck the ground. He lit on his toes and was jackknifed. According to the calculations of the timers, the observers, this man was travelling at the rate of two miles per minute when he struck the ground. His toes entered the ground four inches. Blood spurted from his nose and mouth. He was unconscious for some thirty days. He was in the hospital for some two or three months. He walked into my office with a cane a few months later for a radiograph of his spine. Very much to my surprise there was not a great deal of displacement of any of his vertebrae. He had a compression fracture of the second lumbar and two thoracic vertebrae with a perfectly sound vertebra in between the two compressed fractures of the thoracic vertebrae. This

seems to me to bring up the point that certain ones of his vertebrae must have had less strength than the others.

DR. H. P. DOUB (Detroit, Mich.): This subject which Dr. Blaine has brought up is a very timely one indeed because of its economic importance and because of the fact that it is, or has been until recently, rather imperfectly understood. In fact, the origin of this is not as yet clearly defined. I believe that it behooves us as roentgenologists to insist upon a standard technic for examination of the spine so that we may obtain records of these cases, and also protect the patient against a long disability. The first thing that we should insist upon is a lateral view of the spine with sufficiently good technic to show the bodies of the vertebrae clearly. These cases of injury to the spine which at first show no evidence of bone injury, and which later show narrowing of the bodies of the vertebrae, may result in considerable economic loss because of inability of the patient to do his work.

The cause of this, as Dr. Blaine has explained, is not entirely clear. So far as I can find out in the study of the literature, etc., it would appear to be some nutritional or trophic disturbance due either to injury to the blood supply or nerve of the affected vertebra. One instance has been reported in which an injury case came to postmortem examination. Evidence of considerable injury to the blood vessels supplying the bodies of the lumbar vertebrae, which were narrowed, was seen.

Senile kyphosis, as mentioned by Dr. Blaine, gives somewhat the same picture. There is rather marked osteoporosis. With the marked kyphosis there is a tremendous crushing influence on these vertebrae, which may enter into the etiology or which may accentuate the condition.

DR. BLAINE (closing): The essential point of the story is that in Kummell's dis-

ease we are dealing with a change that develops slowly, usually long after an initial injury. We cannot classify as a case of Kummell's disease any case that shows an immediate compression fracture, such as Dr. Wasson has shown us. His interesting case may add one point to what has been suggested in the paper, namely, that the collapse of a vertebra in the manner shown probably

occurs in a body that has a lessened resistance, and in which there was probably a minor degree of inflammatory change which weakened this one particular bone—the one to give way to the force which the normal vertebræ resisted. A chain is no stronger than its weakest link in mechanics, and this is probably equally true in bone resistance of the spinal column.

**Moral and Physical Aspects of the X-ray Film Storage Problem.** Charles E. Remy. *Modern Hospital*, April, 1930, XXIV, 59.

**Why X-ray Films should be Preserved Indefinitely.** Ramsay Spillman. *Modern Hospital*, September, 1930, XXXV, 63.

A fair judgment of the arguments advanced by the writers of these two papers depends upon the reading of both, or, as *Modern Hospital* editorially states, "There are two sides to every question," and it is only by a frank discussion of both sides that the ultimate truth may be uncovered."

The first writer advances arguments for the destroying of the great bulk of an institution's films, claiming that the medical staff is responsible in the main for the retention of them beyond a limited period, under a delusion that "some day it will have the time to study these thousands of old X-ray films." He adds: "It has been my observation . . . that after the lapse of even a year, the physician, in studying the patient's past history in relation to his present complaints, depends almost exclusively upon the report of the roentgenologist,

rather than upon the film and its interpretation." Dr. Spillman, in his article, does not allow these statements to go undiscussed.

Writing of acetate films, Dr. Remy makes the admission that he has taken the word of "the representative of a prominent fire underwriters' association" that "he did not know whether or not these films would give off poisonous fumes in case of serious fire." These need not be matters of surmise and hearsay, since they have been scientifically investigated and reported upon, as, for instance, "Safeguarding the Storage of Photographic, Motion Picture, and X-ray Films," by C. R. Brown, Assistant Physicist of the Bureau of Standards, Washington (*RADIOLOGY*, May, 1930, XIV, 454).

In Dr. Spillman's reply he analyzes the reasons why a physician may need to re-examine films as a case develops, how an adequate index may make films in storage available for reference without necessitating the handling of those not wanted, and a study of the properties and economics of films.

M. INGLEHART.

## VERRUCA PLANTARIS<sup>1</sup>

By J. NEWTON SISK, M.D., MADISON, WISCONSIN  
Division of Roentgenology, Jackson Clinic, Madison, Wis.

**V**ERRUCA plantaris is an entity frequently not recognized; when observed, it is often classified as a planar callus because of the coincidence in some instances of a considerable amount of keratosis. Since we have been on the alert for this manifestation, it is surprising how commonly it is found. The number of cases now being brought under observation is increasing rapidly, since this condition has been called to the attention of the student health departments of schools and the medical inspection service of institutions fostering gymnastic activities.

Radiologists and dermatologists are beginning to attach more importance to various types of callosities of the feet than they did four or five years ago when very little was written on the subject. Although verruca plantaris apparently is unimportant, the frequency with which pain and sometimes occupational disability occur in these lesions justifies the interest taken. From our experience and from a study of the recent literature, we have concluded that the cause of verruca plantaris is an infection, contagious to the extent that its prevalence approaches endemic proportions.

The cause of the lesions has not been determined, so far as I know, but its dissemination appears, from our study of fifty-three cases, to have a distinct relation to use of the same gymnasiums, shower baths, and swimming pools. I recall the simultaneous occurrence of plantar warts in three members of a family in daily contact with the same shower bath, and in six students from a sorority house who used the same shower bath.

Control of the dissemination of verruca

plantaris does not appear to be easily accomplished. Various modes of disinfection of floors where persons walk with bare feet have been practised without any measure of success. Wearing slippers is quite effective, and the condition is being controlled by this means in some institutions.

The diagnosis of verruca plantaris is simple, but care should be taken not to confuse it with the more common callus seen on the feet. Our early interest in distinguishing verruca plantaris from these callosities was from the observation of extensive keratosis, studded with the characteristic translucent areas, at sites where the irritation of weight-bearing or the pressure of ill-fitting shoes did not exist. There is a period in its life history when the verruca does not show the pin-point dots described by Taussig and Miller (1). In this stage it probably is inactive and, unless involved in extensive callus that is constantly irritated, it is not sensitive to pressure and the patient does not realize its presence. In a few of our cases the history of these warts extended over several years, with periods of activity which subsided and again became active with pain on pressure.

Verruca plantaris usually occurs on the anterior half of the feet. In three of our cases the lesions occurred on the heels; the toes were involved in six cases. All other locations were on or near the transverse plantar arch. Two patients presented multiple lesions evidently consisting of one parent location with more than twenty-five secondary lesions widely disseminated over the anterior half of the plantar surface. Eight had discrete verrucas, three a single lesion, and the remaining number two or three discrete verrucas.

Our study of fifty-three cases successfully

<sup>1</sup>Read before the Radiological Society of North America at the Fifteenth Annual Meeting, at Toronto, Dec. 2 to 6, 1929.

treated by X-ray has convinced us that the condition is not limited to age, sex, color, race, or occupation. The ages in this series varied from eight to forty years. There were forty-six females, which included thirty-three students, three white and two colored domestics, three stenographers, two cashiers, and three nurses; seven men, including two doctors, one minister, one jockey, two students, and one colored janitor.

Three of our patients had had three treatments with electrodesiccation three months previous to X-ray treatment; they complained of pain with electrodesiccation and the result was unsuccessful. One patient had had one radium treatment of an hour's duration, without noticeable results. We have observed the surgical treatment in three cases; the result was satisfactory but the convalescent period was long and was associated with considerable pain and some disability. With the exception of two cases, pain was relieved after the fourth day following the first X-ray treatment and the convalescent period was about four weeks; the longest period was seven weeks, at which time all evidence of the growth had disappeared.

Our technic is a dose twice the time required to produce a mild erythema on the flexor surfaces, with unfiltered radiation limited to the bounds of the lesion, followed, if required, in three weeks by a dose of one and one-half erythema intensity. In only two cases was it necessary to give further radiation—the greatest number of treatments was five in a single case. In none of our cases was there a period of disability. Many of the patients mentioned that the sites treated were slightly tender to pressure for a day or two, several days after the first treatment.

#### CONCLUSIONS

1. Verruca plantaris is a more common disease than is generally recognized.

2. It is caused by an infective agent and is contagious.

3. Because of the complete cure of the disease without pain or disability, X-ray treatment is the method of choice.

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#### DISCUSSION

DR. W. W. BELDEN (New York): It is rather embarrassing for me to discuss a paper on therapy when I see here such eminent therapists as Dr. Remer, of New York, our Chairman, and others. However, I was pleased to hear Dr. Sisk's paper and I think he covered the subject very completely indeed. There is only one point I should like to bring out, that, in our experience, both in the office and at the hospital, we have found there is one technic which has been efficacious—a combination of the so-called superficial and moderately deep therapy; in other words, the filtered and unfiltered radiation. We use the following technic: Shielding down carefully around the lesion with lead, we apply a 6-inch gap, 3 ma. of current, 2 min. exposure time, at one-eighth inch distance. These figures work out, according to the formula of Witherbee and Remer, to one unfiltered unit. We then change our setting to a 9-inch backup spark gap, with 5 ma. of current, 3 mm. aluminum filter, at a 10-inch distance, and give the lesion two minutes more at the same sitting. We have found that by using this technic, the warts, callosities, etc., disappear more rapidly.

DR. CASSIE B. ROSE (Chicago): I much appreciate Dr. Sisk's paper. I have treated a good many plantar warts in practically the same way as Dr. Sisk has described, and have found, as he has, that the pain is greatly relieved within two or three days. Occa-



sionally the pain returns after two weeks or so, usually not so severe as the original pain. A second treatment is given. Rarely have I needed more than two X-ray treatments to accomplish a cure. I believe that X-ray is a simple and satisfactory treatment for verruca plantaris.

DR. SISK (closing): We have not found it necessary to use any dosage other than unfiltered radiation. I should be disinclined to use filtered radiation when there is no indication for it. I had no idea of discussing technic, but the mention of it leads me to say that the milliamperere-minute dose in different institutions is not uniform on account of the variation in tubes. It has been our practice to standardize a broad focus tube for superficial therapy against a skin reaction on a flexor surface. We use 100

kilovolt peak determined by sphere gap, at a skin-to-target distance of 10 inches. It is important carefully to screen with lead around the wart that is being treated.

Failure to produce results with X-ray therapy in verruca plantaris has been reported, but we have not experienced such disappointment when we have been certain that we were treating a plantar wart. We believe that reported failures of not healing warts were failures to remove a callus which might or might not have had an infected site. Calluses are much more difficult to remove by radiation than verruca plantaris, and I think there is considerable difference between a plantar callus and a plantar wart. The literature of the past two years gives sufficient information for a differential diagnosis.

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## SARCOMA OF THE STOMACH

By ROBERT J. REEVES, M.D.

From the Medical Department of Columbia University College of Physicians and Surgeons,  
and the Roentgen-ray Department of the Presbyterian Hospital, NEW YORK CITY

**S**ARCOMA of the stomach is seldom encountered, if one may judge by the reports in the literature. Approximately 200 cases have been reported and they seem to be of more frequent occurrence than individual experience would lead one to infer. In the Berlin Pathological Institute, for instance, there is but one example of sarcoma of the stomach in the 840 specimens. In this discussion I have excluded lymphosarcoma, which is a fairly frequent finding.

Frazier, in 1914, quotes Bruch as being the first to record a case of sarcoma of the stomach, in 1847. Virchow, in 1864, referred to three cases.

Baldy, in 1893, reported the case of a patient who came to him complaining of a mass in the abdomen, which was accompanied by progressive weakness and loss of weight. Physical examination disclosed a large irregular mass filling the entire abdomen from the symphysis to the ensiform cartilage. A small hard mass, the size of a walnut, was found in the umbilicus. There had been no gastro-intestinal symptoms. Operation disclosed a large tumor protruding from the posterior wall and involving practically the entire stomach. There was no microscopical report.

Hartley, in 1896, reported the case of a woman aged 54, whose illness began five years previously with indigestion. She vomited once at that time. She had no more trouble until one year before admission, when she vomited blood on five consecutive mornings. At that time enlargement of the abdomen was noticed. At operation a large tumor of the stomach was found measuring  $8 \times 10 \times 15$  centimeters. The mucosa was hyperemic but not ulcerated. A gastric resection was done and sections of the tumor

showed it to be of the spindle-celled type. The patient was discharged as "cured."

Finlayson, in 1899, reported the case of a child, aged  $3\frac{1}{2}$  years, who was admitted to his service because of a marked anemia and failing health, of three months' duration. There was no pain or tenderness and no palpable masses. The child vomited once before admission. After admission the condition became steadily worse—profound anemia, vomiting, coma, and death. Necropsy disclosed a tumor of the posterior wall of the stomach near the cardia which measured  $2 \times 4$  cm. in diameter. The mucous membrane beneath this area was ulcerated. Microscopical examination disclosed a spindle-celled sarcoma.

Haggard gives probably the most complete *résumé* of the literature and classification of sarcoma according to the microscopic appearance. He was able to obtain a microscopic diagnosis in 76 of 107 cases operated upon. According to his classification there are seventeen different varieties of sarcoma of the stomach.

Fenwick, in 1901, reported the case of a young woman, aged 22, who came to him complaining of severe pains in the epigastrium of one year's duration. The first symptoms were those of mild indigestion, gradually becoming more severe, until at the time of her visit she had lost about twenty-five pounds. Pain usually began several hours after a meal, lasting three or four hours, with no relief from food. The attacks were associated with heartburn and frequent belching of sour or tasteless gases. A hard palpable mass was present in the right hypochondrium. Operation disclosed a large intramural tumor mass occupying the greater portion of the pyloric end of the

stomach. A partial gastrectomy was performed and the pathological report was fibrosarcoma. A physical examination fifteen months after the operation showed no evidence of recurrence and the patient had gained fifty pounds in weight.

Hall, in 1928, reported the case of a young man, aged 20, complaining of intermittent pain in the abdomen three months' duration, which had no relation to meals. Physical examination disclosed a mass about the size of the clenched fist in the left hypochondriac region, extending into the epigastrium. The mass was smooth and slightly movable. Blood test showed a moderate degree of anemia. Operation disclosed a tumor mass involving almost the entire stomach and adherent to the pancreas and liver. Sections of the tumor revealed small round cells of a typically sarcomatous nature.

Douglas, in his analysis of reported cases, found that gastric sarcoma occurs in younger individuals than does carcinoma. The average age incidence for sarcoma was 41.6 years, as compared with 61.2 years for carcinoma. The youngest case reported is Finlayson's, a boy of 3½ years. The oldest was found in a man of 85 (Gosset). Although sarcoma is thought to be a disease of young adults, it seems to be more frequently found after the fortieth year.

Carnot and Lambling, in 1928, reported a most interesting case. A woman, aged 42, was admitted to the wards of the Hôtel Dieu, complaining of cardiac disturbance and showing marked anemia. For a number of months she had noticed weakness of the legs and a constant pain in the right upper abdomen, not related to the taking of food. Following this, she began having palpitation and frequent pains over the heart. A palpable mass was found in the epigastrium. Because of the cardiac condition, operation was delayed. She became steadily worse, and died. Necropsy disclosed a large tumor mass almost completely filling the right auri-

cle. It was attached to its posterior inferior margin and had infiltrated the walls of the superior vena cava. In the stomach was a large multilobulated mass 14 cm. in diameter which had not eroded the mucosa. The microscopical studies disclosed sarcoma of the stomach and metastases in the liver, apparently extending through the posterior mediastinum into the heart.

Boyd, in his textbook on Surgical Pathology, states that, "sarcoma of the stomach is of equal frequency in men and women."

#### ETIOLOGY

The etiology of sarcoma of the stomach, like carcinoma, is unknown. Many believe, as does Ewing, that inflammatory changes are significant predisposing factors. The case reported by Pistocchi is interesting in that the symptoms followed severe trauma of the epigastrium. He is inclined to accept a direct connection with trauma as a causative factor.

#### CLASSIFICATION

Sarcomas are connective tissue growths, hence they never develop from the mucous membrane. According to their tissue origin they may be fibrosarcomas, myosarcomas, or lymphosarcomas. According to Douglas' classification, there are three main groups: (1) lymphosarcoma, which is the most common, (2) round cell, and (3) spindle cell or fibrosarcoma.

The round-cell type is often found to begin as an infiltration of the submucosa, which subsequently spreads into the muscular coat through its interstitial connective tissue, finally destroying and replacing contractile fibers. At first the mucous membrane is merely stretched by the subjacent growth and atrophies from pressure, while at the later stage it is often invaded by the disease and may undergo ulceration.

The spindle-celled type presents itself as

a round or oval circumscribed tumor of the stomach wall, situated usually near the curvatures. As the tumor grows it projects more beneath the serous coat and exerts sufficient traction upon its site of origin so that



Fig. 1. Case 1. Roentgenogram of the stomach showing the filling defect on the greater curvature.

in the later stages it not only drags the entire stomach downward but often acquires a pedunculated appearance. It is usually smooth and firm on section. As the bulk increases, it often becomes irregular in shape. Degeneration and ulceration have been found in a number of cases.

Microscopically the structure varies between wide limits. In some cases the type approaches that of a cellular myoma and the recognition of a myogenous origin is readily accomplished. The differentiation between a myosarcoma and a spindle-celled sarcoma, according to Ewing, largely depends on the attitude of the observer. He believes that many of the so-called round-celled sarcomas are of muscular origin. In some cases careful examination has revealed typical myosarcoma in one portion, spindle cells in another, and elsewhere only round

cells (Moser). The arrangement of the cells in intertwining bundles is often a characteristic feature. The grouping of cells about blood vessels has sometimes suggested that the tumor arises from the walls of the vessels as in myoma uteri (Kaufman), and it has led to the diagnosis of angiosarcoma or lymphangiosarcoma.

#### SYMPTOMS

In a number of cases there were no definite subjective symptoms: this was especially true if the tumor was situated in the pars media and the mucous membrane was not involved. The amount of pain depends on the presence or absence of ulceration. Symptoms may vary from mild epigastric distress to the severe manifestations of carcinoma. Melena and anemia are very common findings, especially in the round-celled type. Rapid loss of weight is often observed, a loss which, however, is readily regained when the patient is put to bed on proper diet: this is especially true in the early stages. Cachexia develops more slowly than in carcinoma. Enlargement of the spleen has been frequently found. It is thought (but not proven) that some of the benign tumors may undergo sarcomatous degeneration. One such case reported is that of a patient who had had a tumor for years which was thought to be an ovarian cyst. Operation revealed a sarcoma of the stomach wall.

Metastases appeared in about 30 or 40 per cent of the cases. The round-celled type is thought to be more malignant and metastasizes more readily, whereas the spindle-celled is usually slow in growth and likewise slow to metastasize. Perforation is more common in the round-celled type.

#### CASE REPORTS

Case 1 (Unit No. 67,090). An Italian furniture salesman, aged 43, was admitted to the Presbyterian Hospital, New York

City, October 25, 1926, complaining of pain in the abdomen, which had been intermittent over a period of several months. He had apparently been in good health until the past four or five months, when he began to be

sion there had been an irregular temperature, at times reaching 104 degrees.

Physical examination was essentially negative except for the abdomen. The liver was three fingerbreadths below the costal



Fig. 2. Photographs of the tumor removed (Case 1). The margins are raised and project into the lumen of the stomach. The center is ulcerated.

severely constipated and to have vague cramps in the abdomen, coming on usually an hour or more after eating and relieved by sodium bicarbonate. These attacks had appeared every three or four days for several weeks prior to admission. There were no gaseous eructations or real pain. Four weeks prior to admission nausea was persistent but he vomited only once; the vomitus was said to be of a dark brown color. He gradually became worse and complained of some dizziness. Because of his nausea and gastric discomfort he could eat very little, to which he attributed the loss of fifteen or twenty pounds in weight. No tarry stools had been observed nor had he noticed jaundice. For three weeks prior to admis-

margin. The spleen was barely palpable. There was a definite tenderness in the epigastrium, to the right of the midline. No palpable masses could be detected.

The blood examination disclosed a hemoglobin of 15 or 20 per cent; red blood cells 1,500,000; white cells, 16,000. A blood Wassermann was negative. The stools on several occasions showed a positive guaiac test.

Roentgen examination of the lungs disclosed an old fibrosed tuberculous process in both apices. The barium meal showed the stomach to be median in position, atonic, and with very few peristaltic waves—only over the antrum. A broad, irregular filling defect was present on the greater curvature,



beginning about an inch from the upper margin of the fundus and extending over an area about three inches in diameter. There was no six-hour residue. A diagnosis of carcinoma was made, and, because of its



Fig. 3, Case 2. Roentgenogram of the stomach showing the large area of infiltration along the lesser curvature.

situation, the neoplasm was thought to be inoperable.

Occult blood continued to be present in the stools. After several transfusions the hemoglobin came up to 45 per cent and the red cells to 2,900,000. After three weeks in the hospital he felt much better and was discharged against advice. Two weeks later the pain became more severe and tarry stools were again noted.

He was readmitted February 13, with a hemoglobin of 75 per cent and a red cell count of 3,800,000. Operation was performed by Dr. Fordyce B. St. John on February 14. A tumor mass was found involving the posterior portion of the pars media,

measuring  $4 \times 5 \times 2$  cm. and showing an ulcerating crater 2 cm. deep. No definite regional lymph nodes could be felt. A high sleeve resection and posterior gastro-enterostomy were performed.

The pathological report follows: "Microscopical examination disclosed an interstitial growth lying between the mucous membrane and the outer coat of the muscle. The mucous membrane covers it except in the crater of the ulcer. The muscle coat lies external to it, except at one or two points where the tumor lies in the subserous tissue. Numerous bands of fibers run in different directions and tend to interlace. The fibrils of the tumor are very slender but with a van Gieson stain they are garnet, whereas the supporting collagen fibrils are a deep red. This means that the nature of the fibrils cannot be definitely determined. The cells appear rather large, elongated, with hyperchromatic nuclei. Mitoses were seen in an average of one to every two high power fields. These findings place the tumor in the group of stomach sarcomas, called by Ewing 'spindle-cell myosarcomas.' He finds metastases to the liver very frequently. This type of tumor we have followed in other parts of the body and recurrence is common, but there is no record of metastases. The prognosis for the patient should be relatively good."

Following operation the patient steadily improved and gained seventeen pounds in weight in two months. He continued to feel well until November 10, 1927, eight months after the operation, when he began to lose weight and appetite, and developed a cough. The blood count was: hemoglobin 80 per cent, red cells 5,230,000, white cells 11,400.

Roentgen examination of the chest disclosed diffuse malignant metastases. The roentgen examination of the stomach disclosed a filling defect in the upper margin of the cardia, which was suggestive of a recurrence. His condition became steadily

worse and on January 4, 1928, he died. A necropsy permit could not be obtained.

Case 2.<sup>1</sup> N. B., a white girl, aged 13, was admitted to the Mary Imogene Bassett Hospital, February 1, 1930, complaining of headaches, dizziness, and weakness. She had been apparently well until fifteen months previously, when she began having headaches and weakness. There had been no gastro-intestinal symptoms, abdominal pain, gas, bloating, nausea, diarrhea, or constipation. She had lost a few pounds in weight. Five days before admission the symptoms became much worse and she fainted for the first time.

Physical examination was essentially negative except for tenderness over the epigastrium.

The blood count on admission disclosed hemoglobin 28 per cent, red cells 2,000,000, white cells, 6,600. The stool examinations were repeatedly positive for occult blood.

After being placed on a diet consisting of vegetables and large doses of iron, the hemoglobin came up to 69 per cent.

Roentgen examination of the gastro-intestinal tract disclosed a large irregular filling defect, apparently beginning on the lesser curvature in the pyloric region and extending through almost to the greater curvature. A projection was present on the lesser curvature and another on the anterior wall, which had the appearance of penetrating ulcers. The duodenal bulb was well filled and freely movable.

Operation was performed, March 22, by Dr. Monroe McIver, and the findings follow. Upon opening the abdomen a large firm mass was found extending from the pylorus to about the lower third of the stomach. The firm, irregular infiltration extended on the lesser curvature, and on opening the lesser peritoneal cavity, nodular masses could be palpated on the posterior wall of

the stomach almost to the cardia. There were small glands in the omentum between the stomach and the colon. Similar glands could be palpated in the mesentery of the small intestine. Sections were taken and the abdomen closed without drainage.

Microscopical report follows: "The tissue is made up of closely packed cells which vary in morphology from the round cells with scanty cytoplasm to spindle-shaped cells with distinct but by no means abundant cytoplasm. The majority of the cells are of a spindle type and only an occasional mitotic figure is seen. A few budding blood vessels are observed, but in general the tissue is not profusely vascularized. Diagnosis: Spindle-cell sarcoma."

The patient made an uneventful recovery and was discharged on April 7, 1930. The blood count on discharge was: red cells 4,150,000; hemoglobin 83 per cent; white cells 5,100.

Following operation the patient was given deep X-ray therapy, to which there was some reaction. Vomitus obtained during the reaction contained no free HCl.

Examination two months later showed the patient to be apparently well.

#### CONCLUSION

Although primary sarcoma of the stomach is not as rare as it was once thought to be, it is still uncommon enough to warrant a careful study of such cases. The character of this neoplasm varies so widely in the different varieties, from extreme malignancy down to almost certain promise of radical cure, that attention to the possibility of its occurrence as well as to its early diagnosis, is a matter of utmost importance. The prognosis in these cases seems to vary according to the duration of the disease, extent of involvement, and type of growth. A number of cases have been reported to be well a number of years after operation, but

<sup>1</sup>I am indebted to Dr. George MacKenzie for the opportunity to report this case.

in numerous instances the diagnosis has been made so late in the course of the disease that operative procedure was of no avail. Where, however, early operation was undertaken, radical cure, or at least freedom from recurrence for a number of years, has been frequently obtained.

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## HIGH MILLIAMPERAGE TECHNIC<sup>1</sup>

By JOHN D. LAWSON, M.D.

From the Department of Radiology, Woodland Clinic, WOODLAND, CALIFORNIA

**M**OTION is one factor in radiography over which the technician has no control, but the production of satisfactory roentgenograms requires its elimination. Particularly is this true of the structures comprising and lying within the thoracic and abdominal walls. Movements of these tissues may be either involuntary, as associated with the physiologic activity of the viscera, or voluntary. Control, or rather elimination, of motion requires that films be produced with a very short exposure time, or that other conditions be introduced which will have the same desired effect.

Speed of exposure may be increased in three ways: First, by decreasing the anode-film distance; second, by increasing the amount of current; third, by increasing kilovoltage. In considering the first method, it is noted that on shortening this distance we have produced distortion which, in chest work, produces several unsatisfactory sequelae: First, the cardiac shadow will obscure more lung tissue; second, the diaphragm will obscure more lung tissue; third, the heart size will be increased and no estimate can be made as to its normal size or contour. By accurate radiographic methods, distortion values noted in Table I have been obtained.

TABLE I

Target-film distance	Percentage of distortion	
	Object-film distance 10 in.	Object-film distance 8 in.
36 inches	34.7	18.4
72 "	14.28	10.2
84 "	12.25	8.19
96 "	10.2	6.05
108 "	10.15	4.0

It will be noted that the 72-inch distance, which has been in most common use for

chest examination, shows a rather marked distortion of the object, at least of that portion of the object which is farthest from the film, as the average chest is about eight inches in depth.

The observation has also been made that perception of motion is decreased to a certain extent by distance. Camera-men carefully consider distances in order that moving objects may be properly photographed. Thus it is noted that increased distance is valuable for two reasons in the production of roentgenograms.

However, if, when the distance is increased, the exposure time is accordingly lengthened, the prime purpose will be entirely defeated, as the time of exposure varies inversely as the square of the distance. In order to obtain a short exposure with a long target-film distance, the amount of energy applied to the tube must be increased, creating thereby the necessity for high milliamperage.

For the purpose of this discussion it is assumed that high milliamperage will apply to currents of one hundred or more milliamperes. It is quite true that in certain laboratories 75 ma. are used and considered high, but in view of present equipment and practice it is felt that any current less than the first-mentioned figure should not be classified as such.

For the production and routine utilization of energies as high as 250 ma., with a maximum voltage of not less than 120 K.V.P., it is necessary to have equipment of considerable capacity. It has been found possible to produce these energies consistently with various types of transformers and rectifiers, although the majority of standard machines as they are wired at the factory are not

<sup>1</sup>Presented before the Fifty-ninth Annual Session of the California Medical Association, Del Monte, California, April 28 to May 1, 1930.

adapted for this work, but require changes in hook-up which will increase the energy applied to the autotransformer. This generally results in increasing the voltage variations between autotransformer steps. This is not true in all cases, however, as with the type of valve equipment on which these observations have been based no re-wiring was found necessary. It has been possible to maintain a two-kilovolt variation with each autotransformer step, which is a sufficiently close control to allow perfect gradation of penetration. There is no implication that mechanical rectifiers cannot be applied to this type of radiography, as such is not the case, but it seems that the optimum is more closely approximated by the valve equipment.

The production of these high energies and the handling of them is by no means confined to the energizing apparatus. Tubes are equally important, and during the past five years experiments have been conducted at the Woodland Clinic, using practically every hot cathode tube now on the market. In this work the following tubes have been utilized:

## Coolidge 5-30

## Universal

Fine focus

Medium focus

Broad focus

100 ma.

Muller

3 K.W.

6 K.W.

10 K.W.

20 K.W.

Metalix 6 K.W.

Tube capacity is determined by several factors, namely, focal point dimension, type of focal point, type of anode cooling facilities, type of residual gas in the tube, and degree of exhaustion. Given two tubes with the same effective focal point area, greater energies can be applied successfully and safely to a line focus tube than to a spiral

focus tube. Cooling features play little part in the handling of energies over 100 ma. except to allow a repetition of the exposure sooner. There seems to be little difference in the value of the radiator and the water-cooled types. However, what difference there may be is in favor of water-cooling.

The advantage of the line focus tube lies in the fact that the effective focal point differs materially from the actual focal point, and energy applied to the long focal line allows a much wider distribution of heat without materially increasing the size of the effective focal spot. The degree of exhaustion, of course, enters into all tubes. It would seem that helium-filled tubes are much more uniformly exhausted than the air-filled type, which vary considerably in this respect.

The type of anode probably plays the most important rôle in high speed work. There are two basic target types: the solid tungsten anode, such as is used in the Coolidge Universal tube and does not allow for cooling, and the cooled type, using a tungsten button of moderate thickness for an electronic impact surface. This button is inset in a copper block and connected to the cooling device.

The Universal tube will handle energies as high as 130 kilovolts, and will also accept milliamperages up to 300. In addition to this, it will accept both high kilovoltage and high milliamperage at the same time, although for only a relatively short exposure, the length of which is determined to a considerable extent by the size of the focal point.

It appears that not only does a small focal point cause too much heating at one spot in the tube, but when heavy energies are applied there is apparently not sufficient anode surface to allow for the production of the quantity of radiation that is necessary or expected. In other words, there is a limit to the quantity of rays which can be emitted from a given focal area in a given time.



The life of the Universal tube used in this type of work varies directly with the size of the focal spot. In all cases a deposit of tungsten is laid down on the glass of the tube, and it eventually becomes inoperative, either by reason of the filtration value of the tungsten, or puncture of the tube because of this deposit. Disturbance of the anode surface, such as melting and roughening, plays no important rôle in the dimensions of the pin-point photograph of the effective focal spot, nor does it play any rôle in the service of the tube.

The cooled type of tube with inset tungsten button anode is not so satisfactory where high kilovoltages are used. This appears to be due to the fact that these voltages melt out a spot and form a blister on the anode, causing a change in the inherent characteristics of the tubes. The exact nature of this change has not been definitely proven, although it is certainly due to a change in quantity rather than quality of radiation. Spectroscopic determinations show that the type of wave length is not affected by this condition, nor is the pin-point photograph of the focal point changed. On operation, the tube gives a brilliant illumination when high milliamperages are used. There is also an instability of milliamperage, as is demonstrated by the fact that it does not correspond to that set on the pre-reading meter. When this meter is set for an exposure of 200 milliamperes, about 300 milliamperes are produced, and it would seem that a major portion of this apparent current is used up on the production of light rather than X-rays. All milliamperage readings have been made on a meter in the high tension circuit.

After this damage has taken place the tube may be used in instances in which a small output is desired, but it has no further use insofar as speed work is concerned. This condition pertains in all tubes of this type of construction, regardless of make. We

have demonstrated in the case of the Universal tube that when high voltages are utilized the effective focal point is not different than when low energies are applied; but it is observed that instead of the focal area being equally affected, that portion of the anode closest to the filament receives the bulk of the rays. The target at this point shows much more wear and tear than at any other point in the focal area.

The amount of energy which may be applied to line focus tubes is extremely high when compared to a tube of the corresponding effective focal area in the Coolidge line. For example, the 20 K.W. tube, which has an effective focal point of about half the size of the 100 ma. Coolidge, will accept 300 ma. for one-half second at less than 60 K.V.P. without any evidence of strain on the tube or impairment of it. The 10 K.W. tube will accept 300 ma. for two-tenths of a second, with the kilovoltage noted above, without any difficulty. However, when the penetration is increased above 60 K.W.P., damage to the tube may result.

These limitations hold true for all cooled tubes, the only difference being the greater amount of energy accepted by the line focus tubes as compared with the point focus tube with the same effective focal area.

Much has been said about the effect of size of the focal point on the production of clear-cut detail, and it has often been stated that at a distance of six feet a broad focus tube will give as good definition as does a fine focus tube. In checking this statement and even increasing the distance to as much as nine feet, the fallacy of this argument is definitely proven, as a novice would be able to detect which film was taken on the broad focus tube and which on the fine.

Definition is not satisfactory at any distance when a tube with a focal point of more than 12 mm. is used, and if it is possible to obtain a tube which will handle the load for the average chest with a focal point

of 8 mm., this is the tube of preference. Unfortunately, chests which measure more than the average in depth cannot be handled by this tube, as the use of it at more than 80 K.V.P. is hazardous.

A recent article by Kearsy describes a new tube which has an automatically adjustable focal point, varying directly with the milliamperage. It is questionable whether this tube will ever have a practical application, as the focal spot would be too large when a 250 ma. current is used, judging from the illustrations accompanying the article.

Another notable difficulty is that all Universal tubes will not fulfill identical conditions, even though their apparent characteristics, including focal points, are the same. When one purchases a new Coolidge tube, the checking of it is approached with a mixed feeling, in which both hope and fear are represented. If, after testing, it is found not suited to the work for which it was intended, the purchaser has no redress, but has a tube not applicable to the purpose for which it was procured. Generally speaking, it is impossible to obtain tubes which have been tested at higher capacities, even though no guarantee is asked with them.

Specifications are being submitted for the construction of a line focus tube with effective focal point about 7 mm. square, which we hope will assist in solving our difficulty. This tube is to have a solid tungsten anode and will probably not be cooled.

The economics of high speed work should have serious consideration. In the first place, the chief object of a radiological laboratory is to produce and interpret diagnostic roentgen films. The second consideration is the economic one. The laboratory must be made to pay; otherwise it will not continue in existence.

It is quite evident that the energies noted in this article will cause considerably more

tube deterioration than will a 30 ma. technic. It is also quite evident that greater distances increase this deterioration by reason of the additional energy necessary for the production of a satisfactory roentgenogram. Distortion enters into the determination of distance and must be given due consideration.

After evaluating these various factors and considering the question from all angles, it would seem that the optimum target-plate distance in chest work is 84 inches. This gives a distortion factor of about 8 per cent in the average chest, but it allows the use of lesser energies than does the examination at 9 feet, where the distortion amounts to 4 per cent. Of course, only that portion of the patient farthest from the film is distorted 8 per cent, the intervening tissues showing much less distortion.

The chest technic in use at the Clinic employs the use of 250 ma. for one-twentieth of a second at a distance of 7 feet. Kilovoltage is varied from 65 K.V.P. to 125 K.V.P., depending on the depth of the chest, all other factors remaining constant. The technician is required to measure the depth of the patient's chest before radiography, and the optimum kilovoltage for that depth is used. This requires a detailed exposure chart, but results justify the effort. When this technic is followed, it is astonishing to note the few re-takes which are necessary.

In gastro-intestinal work, distortion does not play such an important part, and a much shorter target-film distance may be utilized. This, however, is more than compensated for by the depth of the patient at this level and the fact that instead of aerated tissue there are solid structures to penetrate. The focal point need not be so small in this work, as the deviations from normal observed in gastro-intestinal work are more of a gross nature. The opaque medium furnishes a very good contrast, so that the kilovoltage may be considerably increased over that used

in chest work. The exposure, instead of being one-twentieth of a second, is one-tenth.

Examination of the abdominal soft tissues, such as kidney, gall bladder, and spleen, requires the utilization of the Bucky diaphragm. This of necessity increases the exposure time very markedly, but speed is none the less essential, inasmuch as these structures are subject to much the same motion factors as are the structures which have been previously considered. In view of the great total amount of energy required for this exposure, it has not been found practical to reduce the time below three seconds, and accordingly a 10 K.W. Muller tube at 100 ma. for three seconds, again varying kilovoltage with the depth of the patient, will produce the best results. If a finer focal point is deemed advisable, the 6 K.W. tube may be utilized, but the milliamperage necessarily must be cut in half and the time doubled, otherwise the tube may be damaged. The 10 K.W. tube gives detail as fine, if not finer, than is obtained when the 5-30 Coolidge radiator is used.

#### CONCLUSIONS

Fast radiography is not a passing fancy, nor is it an experimental effort in which a few radicals are interested. It appears that it is an essential procedure for the production of accurate and satisfactory technical work. The laboratory which is not utilizing the many advantages obtained through its use is antiquated and is working a hardship on its roentgenologist, inasmuch as he is called upon to interpret roentgenograms which are not the best.

Roentgenological interpretation under any but optimum conditions, including the best possible films obtainable, is difficult. The roentgenologist should have every aid obtainable to assist him in interpretation, and the greatest single aid in interpretation of those structures lying inside the bony thorax and the abdominal cavity is the use of films taken in the shortest time possible through the use of a milliamperage varying from one hundred upwards, combined with high kilovoltage.

## THE EFFECT OF VARYING VOLUMES OF AIR ON THE DISTRIBUTION OF ROENTGEN ENERGY IN A NON-HOMOGENEOUS MEDIUM

By EUGENE T. LEDDY, M.D., and VITO WITTING, M.D.,<sup>1</sup>

Section on Therapeutic Radiology, The Mayo Clinic, ROCHESTER, MINNESOTA

THE distribution of roentgen energy in a homogeneous medium such as paraffin or water under conditions comparable to those under which various parts of the human body may be irradiated therapeutically is fairly well known. Conclusive information is lacking, however, concerning the distribution of roentgen intensity in a medium which is not homogeneous, and in which varying proportions of air and the absorbing medium are mixed. The advantage of having information on the influence of known amounts of air on distribution of energy in an absorbing body comparable with, although not identical with, the human body is obvious, especially when treatment of such regions as the thorax and abdomen is considered. An attempt was made to obtain information on this point by studying the "dose" of roentgen rays at a depth of 10 cm. in a block of paraffin in which known volumes of air were substituted for paraffin at different levels. Similar researches have been made by Wintz and Rump, by Glasser, and by Weatherwax and Robb, but under different experimental conditions, and the experiments were designed to determine the effect of different volumes of air on the roentgen intensity at different depths. Their conclusions, therefore, are not directly applicable to the problems set forth here, in which the depth remained unchanged.

### METHOD

A number of plates of paraffin, each of which measured 20 by 20 by 0.5 cm., were piled so as to form a solid block. Plates with

visible bubbles of air were discarded. It is probable that many of the plates contained minute volumes of air, but since the individual volume was small and the number of plates large, the chance of the results being vitiated by the presence of any considerable quantity of air was practically excluded.

As a measuring device we have used one or the other of two "thimble type" ionometers designed to measure therapeutic quantities of roentgen rays. Both instruments were protected with lead to exclude all radiation not incident to the chamber. These ionometers were known to have a different hardness error and the measurements obtained by the two differed slightly. The curves derived from such measurements did not have the same value, but had the same general shape. The readings given in this paper are those obtained by the more accurate of the two instruments.

The ionization chamber was placed at the surface, half submerged in a depression in the paraffin which it fitted exactly, and also at a depth of 10 centimeters. When air was to be substituted for paraffin a sufficient number of plates was removed from the block to leave an open space of known dimensions, the initial dimensions of the block remaining the same.

The conditions under which the paraffin was irradiated were as follows: transformer outfit with mechanical rectifier, 195 kilovolts peak, measured by spheres 125 millimeters in diameter; 5 milliamperes of current measured by two ammeters in the high tension circuit; Coolidge air-cooled tube in a tank tube-holding device; rays filtered through 0.75 millimeter of copper and 2 mil-

<sup>1</sup>Special Student in Radiology, The Mayo Foundation.

limeters of aluminum; 50 centimeters focal distance; surface field 10 by 10 centimeters cut in a lead plate 3 millimeters thick, and

ward the surface in steps of 1 centimeter each until the upper plane of the layer of air was 2.5 or 3 centimeters under the sur-

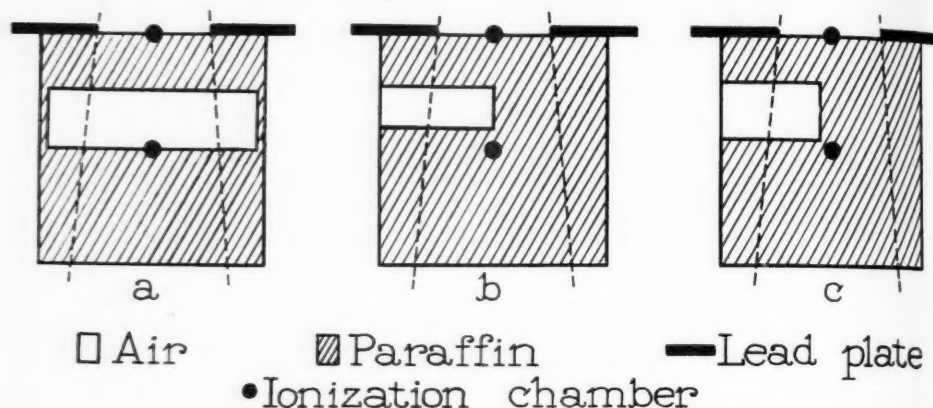


Fig. 1.

the pile of paraffin 20 by 20 by 20 centimeters. The coefficient of absorption of the paraffin was found to be 0.163, and the effective wave length of the roentgen rays, measured by the method of Duane, was 0.15 Ångström unit. The intensity at a depth of 10 centimeters in the solid block of paraffin was 38.3 per cent.

Both the surface and depth intensities were measured under the following different conditions:

1. With air spaces 2, 3.5, and 5 centimeters thick, respectively, extending across the block as shown in Figure 1 (a).

2. With layers of air 3.5 and 5 centimeters thick, respectively, situated at the side of the block, as shown in Figure 1 (b and c). Two different positions were chosen for the layer of air at the side of the block. In one, the plane of division between air and paraffin fell on the axis of the ionization chamber (Fig. 1 (b)); in the other, the the plane of division fell on the side of the chamber (Fig. 1 (c)).

The different layers of air were moved upward from the level of the axis of the chamber, at a depth of 10 centimeters to-

face of the paraffin block, and comparative measurements of ionization were made at each step.

#### RESULTS

When a layer of air was placed across the block of paraffin, as in Figure 1, the depth intensity of roentgen rays varied as shown in Tables I, II, and III and also in Figures 2, 3, and 4.

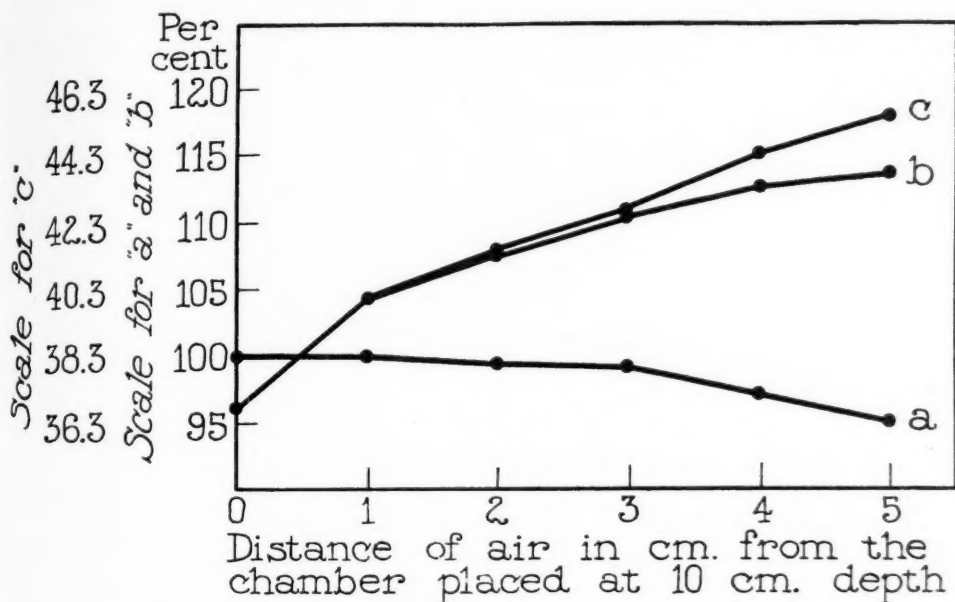
TABLE I  
EFFECTS OF A LAYER OF AIR 2 CM. THICK  
EXTENDING ACROSS THE BLOCK OF  
PARAFFIN

Distance of layer of air from ionization chamber (cm.)	Distance of layer of air from upper surface (cm.)	Air in block (per cent)	Intensity compared with that seen when a solid block was used (per cent)		Intensity at depth of 10 cm. compared with surface intensity of same block (per cent)
			At upper surface	At depth of 10 cm.	
	8	22.91	100.0	96.13	36.82
1	7	22.16	100.0	104.4	40.0
2	6	21.44	99.5	107.6	41.42
3	5	20.69	99.37	110.6	42.59
4	4	19.95	97.3	112.8	44.36
5	3	19.21	95.36	113.8	45.60



With a small amount of air, as when a layer 2 centimeters thick was used, the intensity was actually less than in the solid

block when the inferior plane of this layer lay at the level of the axis of the ionization chamber. However, in moving this layer of



a=Surface intensity } compared with a solid  
 b=Intensity at 10 cm. depth } block of paraffin  
 c=Intensity at 10 cm. depth in terms of surface intensity

Fig. 2.

TABLE II

EFFECTS OF A LAYER OF AIR 3.5 CM. THICK  
 EXTENDING ACROSS THE BLOCK OF  
 PARAFFIN

Distance of layer of air from ionization chamber (cm.)	Distance of layer of air from upper surface (cm.)	Air in block (per cent)	Intensity compared with that seen when a solid block was used (per cent)		Intensity at depth of 10 cm. compared with intensity at surface of same block (per cent)
			At upper surface	At depth of 10 cm.	
36.82	6.5	39.16	100.0	102.8	39.37
40.0	5.5	37.84	99.4	112.6	43.37
41.42	4.5	36.60	98.64	119.7	46.47
42.59	3.5	35.20	96.67	123.8	48.97
44.36	2.5	34.05	95.4	127.8	51.22
45.60					

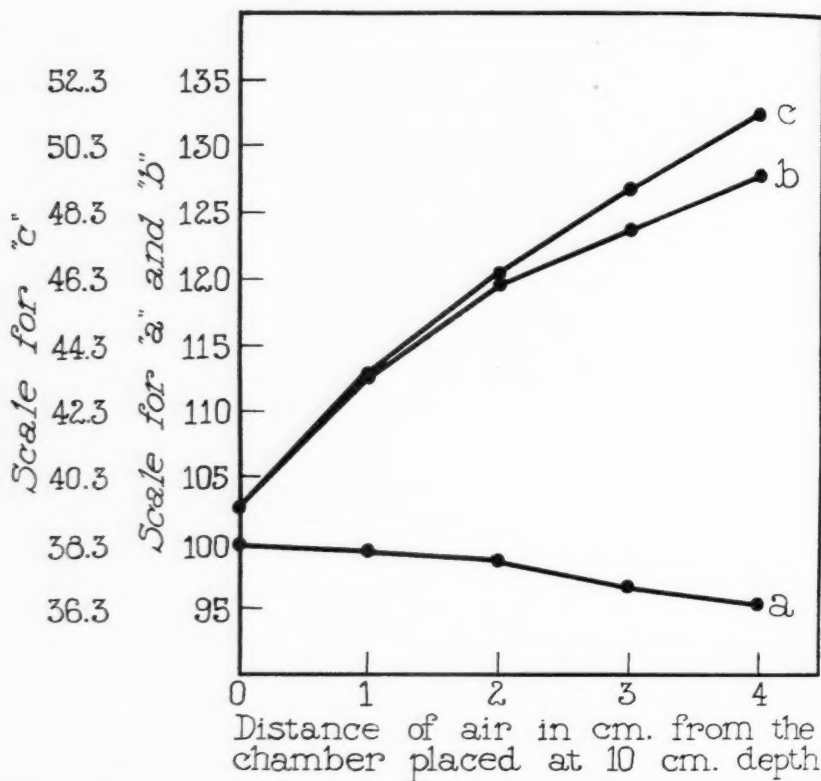
air toward the surface of the block, the intensity increased markedly.

When the layer of air used was 3.5 or 5 centimeters thick (Tables II and III, Figs. 3 and 4), the intensity at a depth of 10 centimeters increased, as compared with the solid block when the inferior plane of the layer of air was in the axis of the chamber. When the air was moved toward the surface, the increase was more marked than in the first instance. As can be seen in Figures 2, 3, and 4, the rate of increase in intensity as the layer of air was moved away from the ionization chamber was rapid at first. It then decreased and was most marked when

the air was farthest from the ionization chamber.

The surface intensity also was influenced

the plane of division between air and paraffin was the axis of the chamber is shown in Tables IV and V. When the division be-



a=Surface intensity  
 b=Intensity at 10 cm. depth } compared with a  
 c=Intensity at 10 cm. depth in terms of } solid block of paraffin  
 surface intensity

Fig. 3.

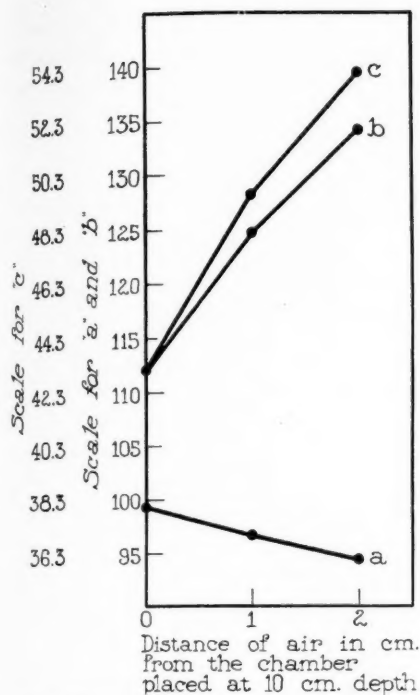
by an underlying layer of air, as can be seen in Tables I, II, and III, and Figures 2, 3, and 4. When the layer of air was 5 centimeters or more below the surface, and extended across the width of the block of paraffin, the surface intensity was not affected.

Different results were obtained when the air was placed at the side of the block, as in Figures 2 and 3. The depth intensity when

tween air and paraffin was in the plane of the side of the chamber the intensity was always less than in the solid block.

#### COMMENT

These experiments show that the degree to which the intensity at a depth of 10 centimeters is affected by partial substitution of air for paraffin depends on a balancing ef-



a-Surface intensity } compared  
b-Intensity at 10 cm. } with a solid  
depth } block of paraffin  
c-Intensity at 10 cm. depth in  
terms of surface intensity

Fig. 4.

fect between the diminished absorption by the air, which tends to increase the intensity, and the decrease in scattering, which

TABLE III

EFFECTS OF A LAYER OF AIR 5 CM. THICK  
EXTENDING ACROSS THE BLOCK OF  
PARAFFIN

Distance of layer of ionization chamber (cm.)	Distance of layer of air from upper surface (cm.)	Air in block (per cent)	Intensity compared with that seen when a solid block was used (per cent)		Intensity at depth of 10 cm. compared with intensity at surface of same block (per cent)
			At upper surface	At depth of 10 cm.	
	5	54.58	99.31	111.8	43.11
1	4	52.60	96.65	124.6	49.32
2	3	50.87	94.5	134.3	54.16

tends to decrease the intensity at the same level. By shifting the air from the level of the ionization chamber toward the surface without changing the proportion of air and paraffin, the main variable is the scattering.

The intensity measured at the surface also was influenced by an underlying layer of air, but no such influence could be detected when the air was at a depth greater than 5 centimeters below the surface. Back-scattered rays, therefore, did not appear to travel in a direction contrary to that of the primary beam through more than 5 centimeters of paraffin. But when the layer of air was 2.5 centimeters beneath the surface, the inten-

TABLE IV

EFFECTS OF A LAYER OF AIR 3.5 CM. THICK  
PLACED AT THE SIDE OF THE CHAMBER

Distance of air from ionization chamber (cm.)	Ionization chamber half covered by paraffin		Ionization chamber fully covered by paraffin	
	Air in block (per cent)	Intensity at depth of 10 cm. compared with intensity at surface of same block (per cent)	Air in block (per cent)	Intensity at depth of 10 cm. compared with intensity at surface of same block (per cent)
	19.58	40.04	16.3	36.03
1	18.92	40.88	15.63	37.03
2	18.30	46.39	15.05	37.47
3	17.60	45.23	14.41	38.68

TABLE V

EFFECT OF A LAYER OF AIR 5 CM. THICK  
PLACED AT THE SIDE OF THE CHAMBER

Distance of air from ionization chamber (cm.)	Ionization chamber half covered by paraffin		Ionization chamber fully covered by paraffin	
	Air in block (per cent)	Intensity at depth of 10 cm. compared with intensity at surface of same block (per cent)	Air in block (per cent)	Intensity at depth of 10 cm. compared with intensity at surface of same block (per cent)
	27.29	37.37	22.55	35.37
1	26.3	39.07	21.64	36.35
2	25.43	46.65	20.45	35.15

sity at the surface was only 4.6 per cent less than in the solid block, which shows that the greatest amount of scattering came from the medium immediately surrounding the chamber.

#### CONCLUSIONS

Measurement of the intensity distribution of roentgen rays in the depths, as well as at the surface, of a paraffin block, are altered by various volumes of air and also by the relative position of the air with reference to the paraffin and to the ionization chamber. The greater the volume of air the greater are the changes noted. These are due to a

balancing effect between decreased absorption and scattering of the incident rays in comparison with the absorption and scattering in a solid medium.

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REPORT ON THE USE OF RADIUM AND DEEP THERAPY X-RAY  
FOR THE LAST SEVEN YEARS IN A PRIVATE CLINIC  
IN MAINE, WITH SPECIAL REFERENCE TO THE  
PROBLEMS OF THE SMALL COMMUNITY<sup>1</sup>

By BARBARA HUNT, M.D., BANGOR, MAINE

**M**Y defense for occupying your time and attention with this small group of cases lies in the necessity for investigation and evaluation of the small clinics. Until cancer services become better organized and hospitals become more commonly equipped with radium and deep therapy X-ray machines, there is a field for these institutions with their proximity and close touch with the public. In this way, perhaps, they aid in the earlier recognition and treatment of malignancies, from which quarter there is hope of bettering our results.

Our clinic is equipped with a supply of radium element, amounting to 210 milligrams, contained in six needles of steel alloy, 12½ milligrams each; three capsules of 5/10 millimeter silver, two containing 50 milligrams of radium, the other 25. A deep X-ray therapy machine of 200,000-volt capacity was added in 1923, and changed to a constant potential type in 1928. The erythema time of the latter is about 80 minutes at 180,000 volts, copper 5/10 millimeter, aluminum 1 millimeter, distance 50 centimeters, with a wave length of about 0.17 to 0.21 measured by a Duane ionization chamber. There is also an electrocoagulation machine. A competent pathologist and surgeons are available.

CANCER OF THE SKIN

This is the largest group of cases, numbering 279, with deaths from cancer 24, and cases known free from disease 197. These

cancers, while among the easiest to cure when treated within a reasonable time from onset, constitute a large item in the morbidity and, of course, have a certain mortality figure. They seem to be more common on the upper portions of the face, a part of the skin subjected to wind and sun and, frequently, heavily tanned. In women, they are apt to come where frames of glasses press. They occur on the tops of ears after frost bites. In some persons, new ones keep appearing on widely separated parts of the face, although a single occurrence is most usual. Those with brown or black pigment are among the most highly resistant and vicious—the local lesion is difficult to stop, and metastasis is common and fatal. For this reason, brown or black moles should always be removed before cancerous change has taken place. This clinic has found radiation safe and reliable for this purpose.

The ordinary rodent ulcer is treated by surface applications of a mixture of gamma and beta rays of radium, about 300 milligram-hours, all given at one sitting, so that individuals can come from quite a distance, receive treatment, and go home the same day. In cases which do not present the common appearance of the basal-celled growth, it is safer to cover the immediate glandular areas with packs. Needles are inserted in bulky growths, in addition to the surface radiation, which should not be omitted. Advanced cases still appear which have been treated with cancer pastes and, sometimes, inadequate doses of X-ray. Such cases seem to me to do better under a combination

<sup>1</sup>Read before the Radiological Society of North America at the Fifteenth Annual Meeting, at Toronto, Ont., Canada, Dec. 2-6, 1929.



of deep therapy X-ray and distance radium radiation.

#### CANCER OF THE LIP

This group numbers 145 cases, with 21 deaths and 99 cases known to be free from disease. The diagnoses of both these and skin cancers were clinical, based on induration of the base and edges. Wassermann tests have been routine, but a positive Wassermann was not allowed to delay radiation when clinical signs of cancer were present. Among general practitioners there is a tendency to delay radiation in such cases until anti-syphilitic treatment has been given a long trial. This practice leads to a fatal issue.

The common provoking agent is tobacco, and if the lip does not heal promptly, inquiry will almost always reveal re-indulgence in some form. Of course, there are a few cancers occurring in individuals who deny its use: they are apt to have foul teeth or to have suffered an injury to the lip. I find that the general profession is loath to interdict the use of tobacco and I also have all sympathy for these patients, many of whom are aged and have few solaces. However, inspection of the mouths of most tobacco-users shows a chronic inflamed condition which supplies the catalytic agent in those with a cancer strain. Syphilis has not been a prominent factor in my cases.

The treatment was the same as given above—a mixture of gamma and beta radiation at short distance, giving from 300 to 400 milligram-hours on the lip. Sometimes needles were embedded in a bulky growth extending into the mucous membrane of the mouth, and skin erythema doses of deep therapy X-ray or radium pack over the sub-maxillary and sub-mental areas. Palpable glands which might be cervical metastases were treated with erythema doses of both radium and deep therapy X-ray over the same areas. In some cases a

needle has been embedded in the gland for from six to eight hours. There has been no serious trouble with metastatic glands since this method of treatment was started. The results have been very satisfactory, both in healing the lesion on the lip and preventing metastasis. The deaths in this series all occurred in patients treated prior to 1926, and among enfeebled individuals with extensive lesions, and with metastasis already established at the time of treatment. There have been no deaths among those treated since 1926. There can be no doubt but that radiation is a highly satisfactory and reliable method of treating cancer of the lip. It, also, seems to be popular with the public.

#### CANCER OF THE MOUTH

There are 35 patients in this group, of whom 16 are dead and 13 are known to be free from disease. The prognosis of these lesions varies greatly with the character of the growth. Epulis, sarcoma, and some carcinomas yield readily to radiation. The most difficult type is the indurating squamous-celled epithelial ulcer which occurs in the cheek or on the lower alveolar process. This lesion in the mouth is difficult to heal and metastasis is extremely likely. Tobacco is the common cause and leukoplakia and syphilis are often associated with it. Saturation doses of deep therapy X-ray and distance radiation with radium inside the mouth give marked regression and, I think, offer the line of attack, but I have had no ultimate cures in any cases in which the pathological diagnosis showed epithelial pearls.

#### CANCER OF THE UTERINE CERVIX

The number of cases in this group is 104, the known deaths being 70 and the known cases free from disease 26. There are 13 cases free from disease for five years and 7 cases free from disease for three years. In this group some cases were very advanced,

others had been treated first elsewhere, and some had been curetted a week or two before treatment, which procedure seems to me to make the prognosis more grave. There were but three cases which might be termed operable, all the others having more or less fixation of the uterus. Generally speaking, the proliferating cases, although looking advanced, require less radiation and do better than the eroding and indurating. I do not feel that pathologic section is very valuable as a guide to treatment, although it adds to our knowledge of the disease and aids in the prognosis. The embryonic cell types, although radiosensitive, spread so rapidly that the total dose of radiation is the same as in the other types. It is possible to diagnose the different types of cells by clinical methods, and important not to cause loss of blood nor disturb the cellular structures. Radiation in itself cleans up sepsis and relieves toxemia.

These cases were treated with applications of radium in the uterine canal and packs in the vagina—sometimes needles were placed in bulky growths. A wax catheter covered with rubber, holding either the silver tubes or steel needles, was placed in the canal. The packs were made up for each patient from 1 millimeter of lead, 1/10 millimeter of lead foil, a layer each of paper, cotton batting, and rubber dam. These small flat packs can be fitted to the individual vagina and are placed against the bases of the broad ligaments. The treatments are given three times, a week or ten days apart, the patients going home in the meantime. Patients not infrequently enter the hospital the night before treatment and return home on the day the radium is removed. Effort is made to apply radiation the whole length of the uterine canal, and an average total of from 8,000 to 9,000 milligram-hours is given in the course of three weeks. There is no shock and little nausea; rectal and bladder disturbances are

slight, pyometra has not occurred, and the cancerous ulceration disappears and the upper vagina heals over smoothly. Most of the deaths have been caused by broad ligament and abdominal metastases. I do not use deep therapy radiation as a routine, but only when a metastasis is located.

#### CANCER OF THE BREAST

The number of these patients is 58, of whom 41 are now dead from the disease and 8 are known to be free. A separation may be made of the cases treated for post-operative recurrence and those treated by radiation alone: of the former, all except two have died from metastasis to liver or lung, with the external lesion under control; in the latter group there were many extremely advanced, desperate cases for whom the most to be hoped was palliation. However, there were six potentially operable individuals who chose radiation in preference to operation: of these, five are living and in good health; the other one died within two weeks after receiving a second course of deep X-ray therapy. Perhaps her death was caused by the treatment. This point is significant; none of the five receiving radiation had metastasis, which is a common cause of death after surgical excision. Two of these cases were treated with radium embedded in the tumor and four with deep therapy X-radiation. I now use the deep X-ray therapy exclusively in the treatment of cancer of the breast because of difficulty in avoiding painful skin reaction from radium. It is well known among radiologists that cancerous tumors of the breast are often very radiosensitive. For this reason I believe in pre-operative radiation.

#### SURVEY OF X-RAY THERAPY

Radiation treatment of cancers of the uterine fundus, vulva and vagina, rectum and prostate is not very satisfactory. It is

true that no method of treatment of these lesions is satisfactory; however, radiation has produced some arrests.

Of four cases of cancer of the foreskin, three lesions have healed, while one patient died shortly after a surgical excision.

Radiation treatment for uterine fibroids, with menorrhagia, has been very satisfactory, both to patients and the doctor. Flowing stops immediately and the tumors disappear gradually.

The treatment of hyperthyroidism by radiation deserves consideration. The basal metabolism can be returned to normal and the symptoms relieved in many cases, so that these individuals are able to continue at work. A second or third treatment—and patience—are sometimes necessary. One of my cases has suffered from a mild myxedema since radiation, which is, however, controlled by thyroid medication. She is not dissatisfied and considers her condition much improved.

Lupus vulgaris has yielded to radium radiation in slightly less dosage than for cancer.

As an aid in handling the cancer situation in the State of Maine, the State Medical Association, co-operating with the Maine Public Health Association, has started public diagnostic clinics in the smaller cities and villages wherever there is a demand from the local physician. The family physician is urged to attend these clinics with his patient, and usually does so. Afterward there is held a dinner or smoker, providing opportunity for discussion with the local fraternity of diagnosis and treatment. The visiting examiners attending these clinics are surgeons and radiologists, thus providing the co-operation which is an essential factor in dealing successfully with the problem of cancer.

#### SUMMARY

Report of end-results in cancers of skin, lip, mouth, uterine cervix, and breast.

Discussion of causes, and methods of treatment.

#### DISCUSSION

DR. HENRY SCHMITZ (Chicago): May I make a few remarks upon the diagnosis of cancer of the cervix? If we wish to get such cases early, a resort to microscopic evidence to clinch the diagnosis must be had. If suspicious looking cervixes are found, then in the interests of the patient we should remove tissues for biopsy. Also the microscopic corroboration of a clinical diagnosis is essential, as a case might slip in with some destructive process of the cervix that was not carcinomatous and thus make statistical deductions unreliable.

Concerning the methods of treatment: We have an American method, which is an interval method, with brass or gold filtration. Then we have the Swedish method, which is also an interval method but uses heavy filtration. And finally the French method of Regaud should be mentioned, which is essentially that of platinum filtration and a continuous insertion of small amounts of radium salts over long periods of time.

It is claimed that the Stockholm and Regaud technics cause less local destruction and the total dosage may be increased to 6,000 and 8,000 milligram element hours. We have observed instances of carcinoma of the cervix in which the light brass-filtered radiation dose did not cause an arrest of growth, but the treatment with lead-filtered radium caused an immediate improvement. It seems to me that any further improvement in radium technic will come with a more general use of heavier filtration.

DR. JOSEPH FRIEDMANN (New York): Dr. Hunt has covered the field fully—and it is an extensive one—so that it is hard for me to take up the entire subject. I will speak briefly on one or two topics on which I have had experience especially, one being

malignancy involving the floor of the mouth. I would prefer that no biopsy be done, because one has a cleaner wound to handle; but most physicians with whom I deal insist upon a biopsy.

In using a plaque in the floor of the mouth, I have found that the results are always disastrous, never a permanent cure. We cocaineize the area and insert needles of 10 milligrams each, the number of them used depending upon the size of the area involved. We place these needles about one centimeter from one another, and, if possible, parallel. Roentgenograms are then taken stereoscopically to determine if the needles have been properly placed. If not, they are taken out and re-inserted. The needles are left in from twelve to sixteen hours, and then are removed. We wait at least three weeks and then give deep roentgen therapy—a full erythema dose—to be completed within from five to seven days, depending upon the general condition of the patient; that is, if he is very robust, we can shorten the time of treatment as above; if his general health is not so good, we give smaller doses and complete the treatment in about two weeks. Then we wait from seven to ten days and follow up with a saturation dose, as recommended by Dr. Pfahler. As a rule, these cases clear up very nicely.

In reference to malignancy of the cervical canal and of the uterine cavity, after uterine radiation has been given, we give from 4,000 to 6,000 milligram-hours in three or four treatments, then wait about two weeks and give X-radiation, using 200,000 volts, until a full dose has been given. We have the patient return to the attending physician in from three to six months for observation. If there are then any signs of recurrence, we continue the treatment.

DR. HUNT (closing): I would like to remark on the principle of invariably making biopsies in cancer. In advanced cancer, especially in the hemorrhagic types, it often starts up more heavy hemorrhage. I do not think it is necessary in the moderate or advanced types. The only types in which I think it is of advantage are the early ones, for purposes of diagnosis.

As to the routine deep therapy treatment in uterine cancer, we know that deep therapy applied to the abdomen is very poorly withstood by anemic individuals. I myself have not seen direct evidence of its value. I think it is difficult to locate the malignancy in the abdomen.

Speaking of cancer of the breast, I use deep therapy almost entirely. Radium is so liable to hurt the skin.

## CASE REPORTS AND NEW DEVICES

### AN ATTACHMENT FOR THE SWEET EYE LOCALIZER

By HAROLD B. THOMPSON, M.D.  
SEATTLE, WASHINGTON

In the June, 1930, issue of *RADIOLOGY*, Harold G. F. Edwards, M.D., of Shreveport, Louisiana, described a very ingenious attachment of a mechanical stage to the old-style Sweet eye localizer, constituting a great improvement in this instrument. I think some one may be interested also in my device, which has been of great aid to me in more accurate eye localization.

The main difficulty in getting exact results with the Sweet localizer lies in the inability of the operator to line up the rod, carrying the ball, with the exact horizontal axis of the eyeball. In regular use, the patient is supposed to fix his vision on a distant object with the upper or uninjured eye in order to stabilize the horizontal axis of the injured eye. With the patient's eyes fixed, the operator is then supposed to sight through the two V-slots in order to place the rod of the ball in line with the horizontal axis of the eye.

It must be apparent to any one who has

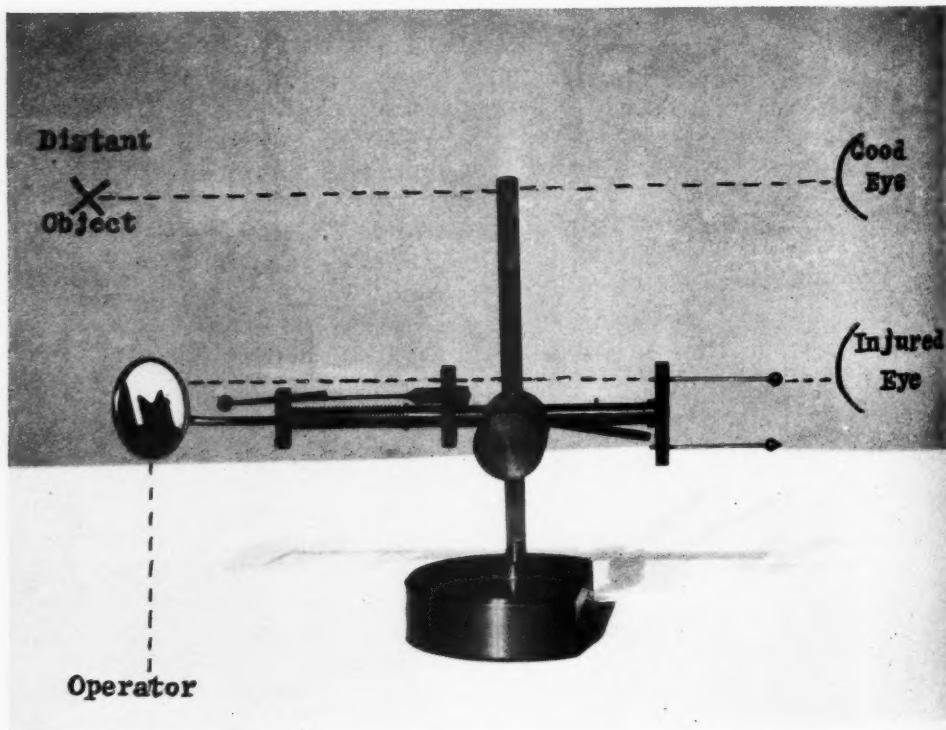


Fig. 1. An ordinary throat mirror attached to the upright standard at approximately a 45-degree angle to the line of the sights.



used the instrument that, in looking through the sights, the operator's head is in the direct line of vision of the patient. The patient then cannot fix his vision on the distant object and the horizontal axis of the eye cannot be kept stationary. The accuracy of the whole procedure is based on this fundamental requirement, and if the rod of the ball is not in line with the horizontal axis of the eye, the whole calculation will be incorrect.

To obviate this, the author has attached an ordinary throat mirror to the upright standard at approximately a 45-degree angle to the line of the sights (Fig. 1). This allows the patient a clear field of vision, enabling him to fix his good eye on a distant object, thereby stabilizing the horizontal axis of the injured eye. At the same time the operator, through the mirror, can exactly adjust the rod of the ball to the exact center of the pupil.

### A METHOD FOR CONTROLLING THE PETROUS TEMPORAL SHADOW

By W. A. RUSH, M.D., Roentgenologist, Hepperlen Clinic and Lutheran Hospital, BEATRICE, NEBRASKA

In spite of well-calculated angles, in making X-ray films of the accessory nasal sinuses we often find that the shadows of the petrous portions of the temporal bones coincide with those of the sinuses, thereby causing difficulty in making a diagnosis.

The explanation which follows describes a maneuver that will throw these undesired shadows entirely out of the way and eliminate uncertainty as to where they will fall.

The petrous portions of the temporal bones are in the same horizontal axis of the skull as the external auditory meatus. This fact was determined by submerging skulls in water to the level of the external auditory meatus. Rotation of the skull, main-

taining this level, demonstrated that the petrous temporals lie in this axis of rotation.

Since it is difficult, in centering the X-ray beam at the middle of the back of the skull, to ascertain where this beam will strike the

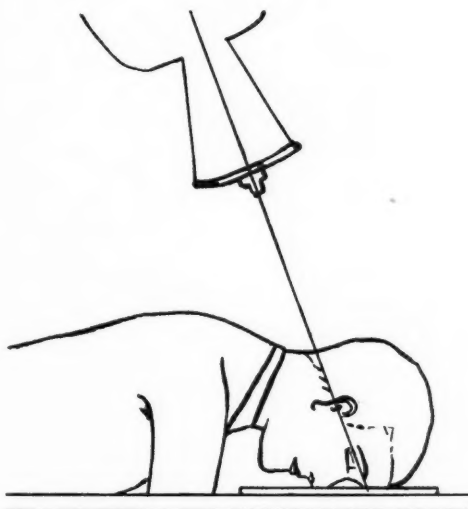


Fig. 1. The central X-ray beam is sent through the external auditory meatus and kept there. The X-ray tube is then angulated so that the beam falls through this point and onto the roentgen film at the place desired for the shadows of the petrous portions of the temporal bones to fall.

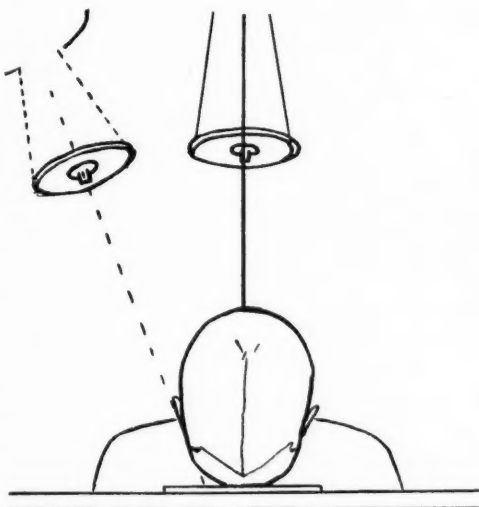


Fig. 2. Front view, showing final position of tube.

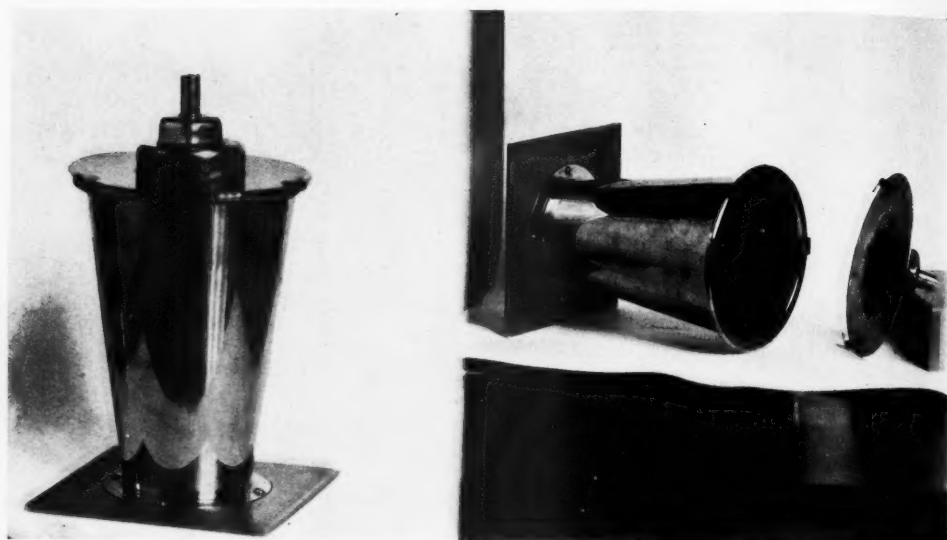


Fig. 3. The device employed for making use of reflected light from the face of the anode to locate the central beam.

X-ray film, we put the above information relative to the positional relationship between the petrous temporals and the external auditory meatus into use. If the central X-ray beam is focussed on the side of the head, it is possible to determine where it will fall on the film. Therefore, we use the external auditory meatus as the visible landmark of the petrous portions of the temporal bones.

The central X-ray beam is sent through the external auditory meatus and kept there. The X-ray tube is then angulated so that the beam falls through this point and onto the roentgen film at the place desired for the shadows of the petrous portions of the temporal bones to fall (Fig. 1).

The tube is kept at this angle and then moved horizontally so that the beam strikes the patient's head in the sagittal center (Fig. 2). The exposure is made, and, when developed, it will be found that the shadows of the petrous portions of the temporal bones fall exactly where desired.

For instance, if the central beam is thrown

in line with the external auditory meatus and the external canthus of the eye, the petrous shadows will coincide with the orbital shadows when the film is made and developed.

Figure 3 shows the device employed for making use of reflected light from the face of the anode to locate the central beam.

#### A TIME SWITCH OF UNUSUAL DESIGN

By ROBERT B. TAFT, M.D., B.S.,  
CHARLESTON, SOUTH CAROLINA

About three years ago the author designed and constructed a simple time switch which has answered every need of accuracy and permanency. When set at any desired time, it will continue to give that exposure as many times as the button or foot switch is pressed. When fluoroscopy is used, the timer is disconnected by a small switch, which may be located on any convenient part of the apparatus.

With the idea of making radiographs at the time of fluoroscopy becoming more general, a simplified time switch of automatic

course, there are excellent automatic timers on the market but their price makes a roentgenologist hesitate before putting one on a

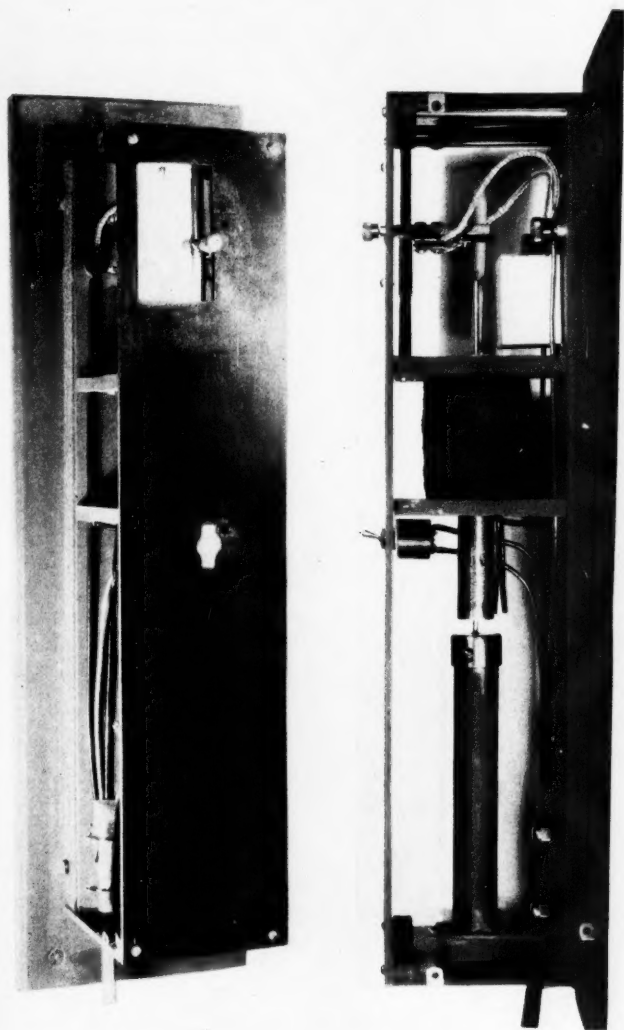


Fig. 1. Front and side views of the author's time switch.

control is a great help, as the necessity of resetting the small hand timer before each exposure is rather a nuisance when multiple exposures are being made. Of

small machine such as is generally employed for fluoroscopy.

The principle involved is that of a solenoid which pulls a core through an oil dash-

pot. The contact system is extremely simple, and so far as the author knows, has not been employed previously, all of the

the diagram (Fig. 2), as soon as the button is pressed which energizes the X-ray machine and the time switch solenoid, the core

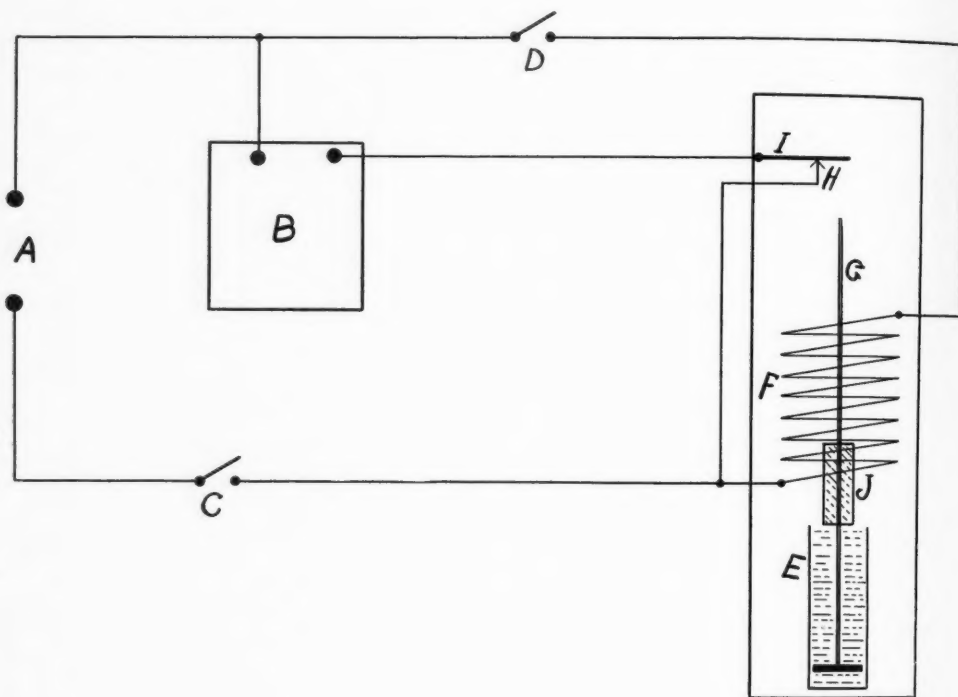


Fig. 2. Diagram of connections for time switch: (A) Connection to main line; (B) magnetic relay on X-ray machine; (C) control switch for X-ray machine; (D) cut-out switch for timer; (E) oil dash-pot with piston; (F) solenoid; (G) brass rod; (H) lower contact point; (I) upper contact point; (J) steel core.

switches on the market using a much more complicated system.

The variable factor in this time switch is the distance which the core moves: the other factors, such as the strength of the magnet and the drag through the oil, remain constant. This feature introduces many elements of simplicity, inasmuch as oil valves are extremely unreliable so far as any accuracy goes. However, the distance of the travel can easily be arranged by simply varying the distance of the contact point mounting from the core. As can be seen by

begins to lift upward, carrying with it a piston in the oil dash-pot. When the brass rod touches the upper contact point mechanism this contact is separated from the lower contact which opens the circuit to the X-ray machine, but not to the solenoid. When the operator removes his finger from the control button the core falls back down to its original position. Of course this switch is intended to be used in conjunction with a magnetic relay, such as is found on all modern X-ray machines, but a condenser of two microfarad capacity is shunted across the

contact points, which practically eliminates arcing. The contact points themselves need not be of any high-grade material, as those which are used on the old style Ford ignition coil give excellent service. The solenoid is wound with approximately two pounds of No. 28 B & S gauge copper wire and a center tap should be brought out, because if the instrument is to be used on 220 volts the entire winding is used or if on 110 volts only half of the winding is used. The core itself is a piece of seamless steel tubing three-quarters of an inch in diameter, no special precaution having been taken to eliminate eddy currents. The oil dashpot is a piece of standard three-quarter inch brass pipe and is filled with heavy grade cylinder oil. The piston is a small aluminum button which does not fit tightly into the cylinder. After the switch is once set up the speed of the travel is determined by filing notches in the sides of the piston until the desired speed is obtained.

This particular instrument covers a range of from one-tenth second to four seconds. After the construction is completed the instrument is calibrated by a stop watch for the longer runs and by a spinning top for the shorter runs.

For ordinary purposes this instrument is quite sufficiently accurate although it is not an absolute precision timer, as there is a very slight change in the viscosity of the oil with different temperature changes.

The time which is necessary for the switch to recover itself for the next exposure is about twice the length of the exposure itself. No re-setting is necessary. Should it become necessary to interrupt the exposure the operator has merely to remove his finger from the control button.

The instrument, as herein described, can easily be constructed in the machine shop found in practically every hospital, and the cost of the materials is negligible. It may be placed in any kind of a housing which suits the convenience of the operator, but

as the accompanying photograph (Fig. 1) shows, a housing built around the baseboard, consisting of a hard rubber face and glass sides, makes a very pleasing appearance. Figure 2 shows the wiring plan.

This instrument has been so completely satisfactory, having stood hard usage for three years during which time the cover has never been removed for any changes or adjustment, that it is believed this description will prove of value to other roentgenologists.

## STATUS THYMICO-LYMPHATICUS: ACUTE EDEMA OF LUNGS

### CASE REPORT

By CHARLES W. PERKINS, M.D.  
NORWALK, CONNECTICUT

Reading the June, 1930, issue of RADIOLOGY (page 605), I was much interested in H. P. Doub's editorial entitled "The Problem of Enlarged Thymus." Because of the wide diversity of opinion relative to thymic symptoms and studies of that gland, the following report may be of interest. The case came under my observation in November, 1928, while I was Director of the X-ray Department of the United Hospital, Port Chester, New York.

The patient was a supposedly normal child four months of age, without a history of previous illness. While his mother was out of the room, in another part of the house, he was left in his crib alone, any abnormal condition being unsuspected. Upon his mother's return she found him cyanotic and practically moribund. Dr. R. A. Higgons, of Port Chester, was called immediately, but by the time he arrived the child was dead. The supposition is that the child became frightened because of his mother's absence from the room.

The following is the autopsy report made by Dr. Margaret Loder, pathologist of the United Hospital, Port Chester, New York:



"Body is that of a male child, normally developed, particularly large and fat for the age (four months). Testicles descended normally. A few small glands are palpable in the left inguinal region, and one fairly large gland in the right cervical region (anterior). Ear drums appear normal. Frothy material is oozing from both nostrils.

"*Chest.*—Thymus gland is enormously hypertrophied, measuring 80 x 70 x 30 mm. and weighing 50 grams. Central portions of both lateral lobes show some liquefaction necrosis. Gland covers the aorta, trachea, and bronchi, and comes down well over the pericardium. Both lungs show marked edema throughout. The same material that was seen coming from the nostrils oozes from the larger bronchi. There is no obstruction in the bronchi, trachea, or posterior pharynx. Thoracic nodes are not enlarged. Heart appears normal; chambers are empty.

"*Abdomen.*—Lymph nodes are enlarged throughout the mesentery, which enlargement appears to be due to a simple hyperplasia, and there is apparently no necrosis of these glands. Other organs appear normal.

"*Extremities and genitalia.*—Normal.

"*Diagnosis.* — Status thymico-lymphaticus: acute edema of lungs."

In my paper entitled "Studies of the Thymus, with Roentgen Findings" (*Am. Jour. Roentgenol. and Rad. Ther.*, March, 1929, XXI, 256), I reported the death of a child four years of age who died suddenly in primary anesthesia. The autopsy findings were as follows: status lymphaticus, the thymus gland weighing 35 grams. No previous X-ray examination of this patient's chest had been made.

There is every reason to believe that many cases of sudden death occur in which autopsy findings are not obtained.

# EDITORIAL

M. J. HUBENY, M.D. . . . . *Editor*  
BENJAMIN H. ORNDORFF, M.D. . . . . *Associate Editor*

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Radiological Society of North America.*

## MEDICAL LEGISLATION

The existing medical laws in this country, with few exceptions, are inadequate to protect our people against the increasing number of quacks and isms. There are about ninety different such cults in this country, a large number of which are openly violating the law, by inflicting their various trades upon an innocent public. It is a well known fact that organized medicine suffers as a result of this unfortunate condition. Whatever action we have taken, or will take against the activities of such persons, is always calculated to protect an unsuspecting public, who depend entirely upon organized medicine for advice in such matters.

We, as physicians, have always been timid in demanding our rights, when adverse medical legislation is proposed. It may be that many of us are fearful that any concerted action manifested by the medical profession may be construed by legislators as coming from a medical trust. Such fear is not well founded. It has been my experience, as a member of medical legislative committees for many years, that legislators will always give a respectful hearing to any medical committee representing organized medicine. As politicians, they appreciate the tremendous influence that organized medicine can bring to bear on any

issue. For this reason it becomes the duty of organized medicine in every State, to take advantage of its strength and exert its influence before legislative bodies in defeating any measure calculated to be harmful to the medical profession as well as to the public.

We, as radiologists, are sadly in need of protective legislation at this time. A cursory examination makes it very clear that many States are extremely lax in the protection of the radiologist. One of the most essential legislative acts needed at this time is a revision by amendment of the Medical Practice Act in those States where the radiologist is insufficiently protected. The medical law should be made to read in substance that the practice of radiology is understood to mean the practice of medicine. In this manner the radiologist will be accorded the same protection by law as any of the other specialties of medicine. In this connection, I wish to sound a note of warning in regard to amending any Medical Practice Act. Many of the cults and isms that are unrecognized in many States are awaiting the opportunity of gaining entrance by offering some sort of compromise when such an act is before the legislature for amendment. A compromise is never to be entertained by organized medicine, as ours is a fight for a principle and theirs is one for gain. By concerted action on the part of the radiologists assisted by the rest of the medical profession, such an obstacle is not usually difficult to overcome.

That many of our medical laws are inadequate, particularly in regard to radiology, is proven by a questionnaire sent out by me as President of the Louisiana State Board of Medical Examiners a few years

ago, when it was shown that 52 per cent of State Boards of Medical Examiners stated that no one other than a regularly licensed physician was permitted to practise the science of radiology. Notice particularly, that while 24 State Boards made the preceding statement, in reality 18, or 39 per cent, of them do permit others besides regularly qualified physicians to practise radiology. Would you believe that 15 per cent of State Boards consider the practice of radiology as the practice of medicine only when treatment is administered?

While it is not my purpose to advertise the activities of organized medicine in Louisiana, our records will show that we have not been derelict in our duty in apprehending and convicting law violators. As an example of such activity, I am proud to announce that there is not a single lay person at this time practising roentgenology in our State. Whatever success we have had in this regard is the result of the combination of several important factors, namely:

1. Medical Practice Act.
2. Efficient and courageous secretary.
3. Special attorney working in conjunction with the office of the Attorney-General of the State.
4. Funds for the State Board of Medical Examiners to function efficiently.
5. Co-operation of radiologists with organized medicine.
6. A non-political State Board of Medical Examiners.

#### MEDICAL PRACTICE ACT

In regard to the Medical Practice Act, it is necessary that teeth be put in the medical law of any State if the State Board is to function efficiently. The Louisiana Medical Law is recognized as among the foremost Medical Practice Acts of the United States, and several parts of it have been adopted by other States. The definition of

the practice of medicine, as given in our act, is very detailed and full in its meaning. It is credited with being one of the most complete definitions on record at this time. The law has stood the test of every court in our State and finally the Supreme Court of the United States. The verdict of the Supreme Court is that it is sound in principle and constitutional.

#### EFFICIENT SECRETARY

The prosecution and conviction of law violators is dependent to a great extent upon the courage and activity of the Secretary of the State Board. We are extremely fortunate in having a Secretary who possesses a phenomenal capacity for pegging away at law violators, and with a bold disregard for danger he has often snatched victory out of the jaws of danger. Our success is largely due to his activity, and I could not praise him enough for the splendid work he has done for organized medicine in Louisiana.

#### SPECIAL ATTORNEY

Our medical law makes provision for the State Board of Medical Examiners to employ special attorneys in prosecuting law violators. We employ such an attorney by the year and he serves the Board in a manner which yields perfect satisfaction. He is privileged to the advice and assistance of the Attorney-General of the State. Such a special attorney is of incalculable help, as it has been our experience that we could not depend on the district attorneys for much help in the prosecution of law violators.

#### FUNDS FOR STATE BOARDS

Many years ago our Board was functioning with very little money—just about enough to meet current expenses. We were then unable to employ special attorneys and

special investigators as we do at the present time. For this reason we had incorporated in our law, during the year 1918, an annual renewal fee of \$2.00. The annual renewal feature of a Medical Practice Act is one of the best known methods of obtaining sufficient finances in order that a State Board may function properly. It is fair to the physicians, and affords them protection in many ways. Only 10 States, in answer to an inquiry sent out some time ago, have a renewal feature, and 31 have not. From this source alone we have a reserve fund of several thousand dollars at all times.

#### CO-OPERATION OF RADIOLOGISTS WITH ORGANIZED MEDICINE

Close co-operation between radiologists and organized medicine is imperative, for in no other way can protective legislation be obtained for the radiologists. Two of our radiologists have served as President of the State Medical Society and one of them is at present President of the State Board of Medical Examiners. Several of our radiologists have served as members on the legislative committees of the State and local medical societies. In other words, the radiologists in our State are in every fight, with the other members of organized medicine, against any adverse medical legislation.

#### A NON-POLITICAL STATE BOARD OF MEDICAL EXAMINERS

A non-political State Board is highly desirable, otherwise the members of this Board may be influenced by politicians against the prosecution of certain law violators. Our Medical Practice Act provides that the State Medical Society shall send to the Governor the names of two physicians, one of whom must by law be accepted by the Governor to fill any vacancy that may exist on the Board. For this reason such an appointment by the Governor is in reality

the choice of the State Medical Society and is, therefore, free from any political entanglements.

LEON J. MENVILLE, M.D.,  
*Chairman of the Legislative  
Committee, Radiological So-  
ciety of North America.*

### THIRD INTERNATIONAL CON- GRESS OF RADIOLOGY

*Paris, July, 1931*

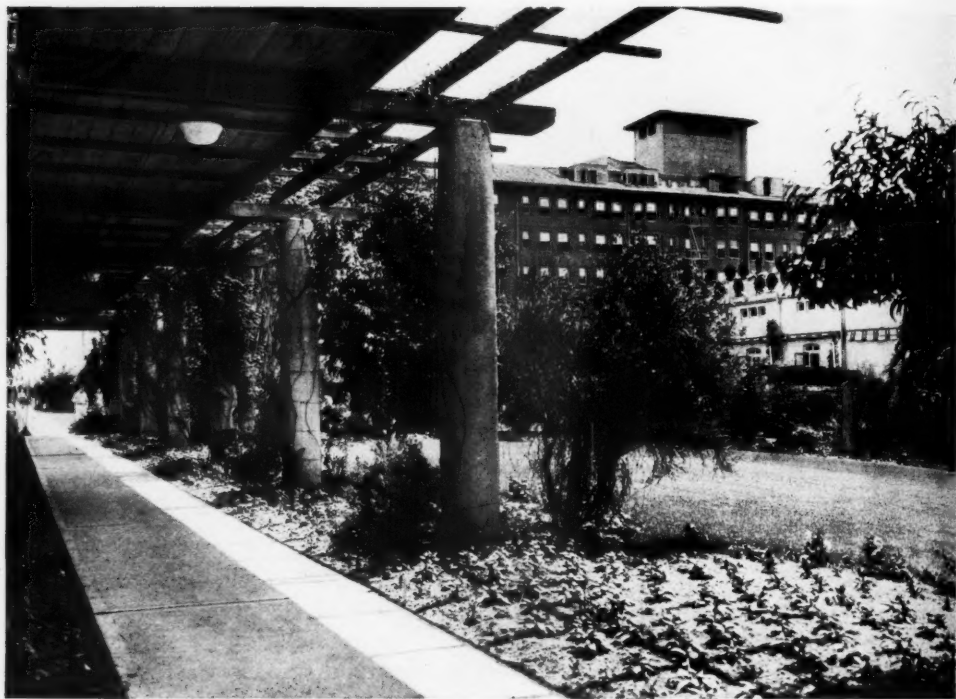
The work of the Congress will be divided into the following sections: (1) Roentgen Diagnosis; (2) Roentgenotherapy and Curietherapy; (3) Radiobiology; (4) Radiophysics; (5) Natural and Artificial Heliotherapy; (6) Medical Electrology.

In conformity with the regulations of the International Congress of Radiology, membership in the Congress will be open to (a) members of the national roentgen societies regularly constituted, and (b) persons accepted by these societies.

The officers of this Third International Congress are as follows: *President*, Dr. Antoine Bécélère, Paris, France; *Vice-presidents*, Dr. J. Belot and Prof. C. Regaud, for Paris, and Prof. Cluzet and Prof. Rechou, for France outside of Paris; *Secretary-general*, Dr. Ledoux-Lebard; *Treasurer*, Dr. Henri de Rothschild; *Adj. Treasurer*, Dr. Morel-Kahn; *Secretaries*, Dr. Claude Bécélère and Dr. P. Gilbert.

The registration fee for the Congress is 300 francs for each individual member, and 50 francs additional for each member of the family attending the Congress. Application blanks will be available at a later date.

The five delegates from the United States are: James T. Case, M.D., Chicago (American College of Radiology); Edwin C. Ernst, M. D., St. Louis, *Secretary of United States delegation* (Radiological Society of North America); Preston M. Hickey, M.D., Ann Arbor, Michigan (American



Hotel Ambassador, Los Angeles, the meeting place of the Sixteenth Annual Meeting of the Radiological Society of North America, Dec. 1 to 5, 1930.

Roentgen Ray Society); Albert Soiland, M.D., Los Angeles, *Chairman of United States delegation* (American Medical Association), and Douglas Quick, M.D., New York (American Radium Society).

Any one desiring more detailed information may feel free to write to either the Chairman or the Secretary of the United States delegation.

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#### ANOTHER MEMBER OF THE SOCIETY HONORED

At the annual meeting of the Louisiana State Medical Society, Sidney C. Barrow, M.D., of Shreveport, was elected without opposition to the presidency for 1931. Dr. Barrow is widely known in the Radiological Society of North America, of which he has

been a respected member since 1918. Radiologists are popular in Louisiana, and for good reason, since two other members of this Society have served their State Medical Society as president in former years—Leon J. Menville, M.D., of New Orleans, and Lester J. Williams, M.D., of Baton Rouge.

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#### THE NEXT ANNUAL MEETING

An invitation is extended to members, friends, and all who are interested in radiology to attend the Sixteenth Annual Meeting of the Radiological Society of North America, to be held in Los Angeles, California, beginning December first and continuing to the evening of December fifth, 1930. The headquarters will be the Ambassador Hotel. The meeting rooms and accommodations for





Avalon Bay, Catalina Island, which may be easily reached by a brief "ocean voyage" from Los Angeles.

those attending will be as good or better than anything we have had at previous meetings.

The officers of the Society have spared no effort to prepare a program offering much helpful information, instruction, and interest. The Local Committee has made splendid arrangements with a view to the comfort and entertainment of those in attendance.

Our exhibitors who have been with us in the past will accompany us to the Coast, exhibiting the standard and the new in apparatus and accessories. In the informality of the exhibition space one renews and makes contacts of value in business, professional, and social life.

As always, the ladies of the families of the men in attendance are welcomed. They will enjoy the diversions planned by the Local Committee, and be given an opportunity to sample the climate of which we hear so much.

ROBERT J. MAY, M.D., *President.*

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#### RADIOGRAPHY AND CLINICAL PHOTOGRAPHY

With the August, 1930, issue, the Eastman Kodak Company has changed the name of its house organ, previously known as "X-ray Bulletin and Clinical Photography,"

to the more truly descriptive one of "Radiography and Clinical Photography." The size of the publication has also been increased, with the aim of widening the scope of usefulness and interest of its departments of information. Its cover bears, together with a portrait of Professor Roentgen, the following dedication: "This publication is inspired by the humanitarian value of X-rays in the alleviation of suffering and the prevention of disease. It is dedicated to a continuation of the work made possible through discoveries by Wilhelm Konrad Roentgen and the pioneers of photography." Its Contents indicates much of real interest and instruction, and roentgenologists and their technical assistants may well form the habit of reading the little journal regularly.

#### IMPORTANT NOTICE

Application has been made for certificate plan convention rate to Los Angeles, and all who expect to return immediately after the meeting may, if they wish to risk paying full fare for return trip (if less than 150 certificates are validated), buy ticket to Los Angeles, secure convention certificate, and present the latter at the registration desk. If 150 certificates are presented for validation, return trip tickets may be purchased for half fare, but these must be used within two or three days, and over the same route as the trip to Los Angeles was made. *If less than 150 certificates are presented, full fare must be paid for the return trip. Purchasers take this risk.*

All-year tourist tickets are sold from all points in this country to Los Angeles, and are usable for return trip any time within nine months. We feel justified in recommending the purchase of these all-year tourist tickets, so that those attending will be sure of saving some considerable amount of the railroad fare. These all-year tourist

tickets are good on all trains, standard Pullman and excess fare trains included, on payment of the Pullman rates and excess fare in addition.

See articles in May RADIOLOGY, page 517, and in September RADIOLOGY, page 410.

I. S. TROSTLER, M.D.

*Manager of Commercial Exhibits  
and Transportation.*

#### JOHN DONALD MacRAE

On the afternoon of September 6 Dr. John Donald MacRae, of Asheville, N. C., was fatally injured when the car in which he was riding with Mrs. MacRae skidded and overturned. Dr. MacRae died within a few minutes after reaching the hospital. Mrs. MacRae was not seriously injured.

Dr. MacRae has been Counselor for North Carolina for a number of years and has always taken a great interest in the Society. He was a Fellow of the American College of Radiology and the dean of radiologists in North Carolina.

John Donald MacRae, born in Fayetteville, N. C., March 10, 1874, was the son of James C. and Frances (Hinsdale) MacRae. His father was at one time Dean of the Law School at the University and Associate Justice of the Supreme Court of North Carolina. Dr. MacRae took his medical degree at the University of Nashville Medical School, in 1897. He married Miss Mary C. Hill the next year. He was in general practice for a number of years, first, in Winslow, Arkansas, and later in Fayetteville, N. C. In 1906 he moved to Tampa, Florida, where, after a few years' general work, he began the practice of radiology, continuing until 1917, when he entered the Army. After spending some time with Dr. Baetjer in Baltimore he served as radiologist in the Base Hospital at Camp McClellan and at Camp Greene, A. E. F., Base 54, and as

consultant radiologist he was at Mesves Hospital Center. Returning from France, he was radiologist for a year at U. S. A. General Hospital No. 19, Oteen, North Carolina. In 1920 he opened an office in Asheville, where, in connection with his private practice and several hospitals, he had continued as consultant radiologist at Oteen.

Dr. MacRae leaves a daughter and a son, Mrs. Carl S. Goodson and Dr. John Donald MacRae, Jr., the latter for the past two years having been associated with his father in the practice of radiology at Asheville, North Carolina.

Dr. MacRae was in reality a *physician practising radiology* and was always held in the highest regard by his confrères. His was a winsomeness that bound men to him "with hoops of steel." He will be sadly missed, not only in his own community but throughout the State and in the Radiological Society of North America, where his contributions were always received with interest and respect, for he spoke as one having authority and knowledge.

#### ACCOMMODATIONS AT THIRD INTERNATIONAL CONGRESS OF RADIOLOGY

As is already known to American radiologists, the Third International Congress of Radiology will be held in Paris, France, July 27 to 31, 1931. The further information has recently been received that the sessions are to be held in the Sorbonne.

Concerning hotel accommodations for those in attendance upon the Congress, the decision has been reached that no particular hotels are to be designated as headquarters, but that each one may select from the hotels of Paris that one which best suits his requirements. However, if one lacks information concerning rates, location, and style of accommodations available, he may learn

much of interest by inquiring of the Chairman for the United States, Albert Soiland, M.D., 1407 South Hope Street, Los Angeles, California.

## BOOK REVIEW

JAHRBUCH FÜR RÖNTGENOLOGEN, 1930. Bearbeitet von K. BRUMMER (Heidelberg), F. BURGHEIM (Berlin), H. CHANTRAINE (Betzdorf), R. DYROFF (Erlangen), L. GREBE (Bonn), A. HEDFELD (Magdeburg), G. HIN (Köln), K. KAESTLE (München), G. KOHLMANN (Oldenburg), F. PELTASON (Darmstadt), O. RIGLER (Hufeland, Darmstadt), St. ROTHMAN (Budapest), A. SEYERLEIN (Elberfeld), F. SCHMITZ (Köln), J. SCHÜTZE (Berlin), M. SCHWARZ (Tübingen), W. STOCK (Tübingen), O. STRAUSS (Berlin), W. TESCHENDORF (Köln), K. WEBER (Köln), R. WERNER (Heidelberg), unter redaktioneller Leitung von O. RIGLER (Hufeland, Darmstadt). Verlag Walter de Gruyter & Co., Berlin and Leipzig, 1930. Gross-Oktav, 220 Seiten, Preis RM. 12.-, geb. R. M. 13, 50 (3.24).

This book introduces a new idea into the book market. It endeavors to arrange in reference form the roentgenologic literature of the past year. The men reviewing the different chapters have been left free to make their own critical selection among the publications. The intention of this and subsequent volumes is to make available the most important of the numerous published articles and to have them reviewed critically in a more or less personal manner. The physician who is interested in roentgenology and who cannot read all the literature has by this means a chance to orient himself rather speedily and to see if he has missed something important in his field. The names of the authors guarantee almost throughout an efficient review of the differ-

ent chapters. I have read some chapters with especial delight, for instance, that of Kaestle (München), about the roentgen diagnosis of the respiratory tract, including the mediastinum and diaphragm; that of R. Werner (Heidelberg), about radium therapy, and that of O. Strauss (Berlin), concerning malignant tumors. One finds, furthermore, some chapters about physical and

technical problems, diagnosis in the different fields, and, finally, about therapy in its different branches. Each chapter has its own bibliography of the contributions pertaining to it.

F. HAENISCH (Hamburg, Germany).

*Translation by H. W. HEFKE, M.D. (Milwaukee, Wisc.).*

## ABSTRACTS OF CURRENT LITERATURE

### AUTHOR INDEX

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## APPENDIX (DIAGNOSIS)

**The Chronic Appendix from the Roentgenological Standpoint.** Adolph Henriques. *New Orleans Med. and Surg. Jour.*, July, 1930, LXXXIII, 29.

By chronic appendix is meant one which has been subjected to repeated acute attacks, according to MacCallum, or one which is chronic from the beginning of the inflammation. Stagnation in the appendix is an important factor in producing inflammation. The stagnant appendix can be demonstrated fluoroscopically to better advantage than by roentgenograms. The appendix fills by retrograde peristalsis, which exists normally in the colon; when this becomes increased, as in spastic constipation, it will fill the appendix. The appendix varies widely in location, and when the palpating finger elicits pain over the filled appendix this is of great diagnostic importance. When not visualized, palpation over the cecum may show points of tenderness corresponding to the location of the appendix. In the production of appendicitis, the writer classifies the following steps in the evolution of the condition: right-sided stasis in colon; increase of retrograde movement of proximal colon; stagnation in the appendix; appendicitis.

W. W. WATKINS, M.D.

**A Study of the Cause of Right-sided Abdominal Pain in So-called Chronic Appendicitis: A Review of 1,027 Cases.** W. A. Bigelow. *Canadian Med. Assn. Jour.*, July, 1930, XXIII, 22.

This series of cases is interesting not only for the end-results, but also for the points in diagnosis and the X-ray methods employed in arriving at a diagnosis.

Emphasis is laid on the fact that chronic right-sided abdominal pain is not often due simply to chronic appendicitis. Pulling or pinching the appendix or its mesentery causes cramps, while traction on the peritoneum through membranes or bands produces the pain of which patients complain. The pain is

produced through the pull on the peritoneum, and differs from appendiceal pain in that it is chronic and dull and not acute and cramp-like. Hence, the surgical method which simply removes the appendix fails in most cases to remove the chronic pain. There must be a thorough removal of all bands and membranes covering the region of the bowel involved, as well as the appendix.

The diagnosis was made by the X-ray, and was in every case due either to bands of the cecum or ascending colon or terminal ileum, or some combination of these. The X-ray work was done in the Bigelow Clinic by the writer. The results recorded are most encouraging. Ninety-three per cent of the patients, reporting in answer to a questionnaire, stated that they were completely cured of their right-sided abdominal pain as the result of the removal of bands and membranes. The operation and the after-treatment are described in detail.

L. J. CARTER, M.D.

**Chronic Appendicitis: Diagnosis and Significance.** Thomas R. Brown and Ernest H. Gaither. *Southern Med. Jour.*, July, 1930, XXIII, 591.

After years of close study of subjective symptoms, objective signs, biopsy, and the continued pre-operative and post-operative observation of numerous cases, these authors are convinced that the pathological entity of chronic appendicitis occurs. As an adjunct to the objective and subjective findings, X-ray is valuable. The method is to administer barium 18 hours before the first fluoroscopic observation, when the patient is carefully studied under the horizontal screen. Then the colon is emptied with a saline, and further careful studies are made. At both times the morphological and sensory characteristics are noted, and these findings, plus the clinical history, subjective and other objective findings (physical and laboratory), will enable the physician to arrive at a dependable conclusion regarding the appendix.

W. W. WATKINS, M.D.

## BLOOD CHANGES

**The Effect of Roentgen Rays on Cholesterol and its Fatty Acid Esters *in Vitro* and *in Vivo*.** Rudolf Hummel. *Strahlentherapie*, 1930, XXXVI, 533.

The fatty acid esters of cholesterol dissolved in chloroform, as well as free cholesterol, can be destroyed by roentgen rays. Cholesterol dissolved in fat or in blood serum, if irradiated *in vitro* by roentgen rays, with a dose of 1,650 r, does not show any changes. The liver of normal mice, as well as the liver of mice following cholesterol feeding, shows the same amount of cholesterol content before and after exposure to roentgen rays, with a dose of 1,100 r.

ERNST A. POHLE, M.D., PH.D.

**Changes in Catalase and Lipase in the Blood of Irradiated Patients.** M. J. Goldstein and J. P. Neworoschkin. *Strahlentherapie*, 1930, XXXVI, 736.

A number of ferments were determined in the blood of patients following exposure to roentgen rays. The amount of catalase was found increased, while lipase increased in some and decreased in others. There is apparently a correlation between the amount of ferment fluctuation and the irradiated organ. The catalase, for instance, showed most characteristic changes following irradiation of the lymphatic system. There was no parallel between the character of the ferment curves and the disease. Further studies are under way.

ERNST A. POHLE, M.D., PH.D.

## BONE (DIAGNOSIS)

**Calcium Rings in Growing Bones.** Anton Gottesleben. *Röntgenpraxis*, Aug. 1, 1930, II, 673.

The conclusions reached by the author from his observations indicate that growth in bones is not regular. Rather, it is dependent on different factors, and is most marked in the warm seasons and least marked in the cold.

The growth optimum during the warm season may be explained by the action of the ultra-violet rays during this season. This irregularity of bone-growth leads to the formation of roentgenologically demonstrable shadows and rings in the skeleton, which are localized around the growth-centers, if certain conditions are favorable. Exogenous and endogenous causes may lead to either increase or decrease of bone-growth. Hyperemia, prolonged rest, and changes in diet must be considered as exogenous causes; the action of the endocrine system and its pathologic changes as an endogenous cause. A pathologic process localized in the zone of bone-growth, and a disturbance in the calcium resorption are factors which may produce calcium rings in the skeleton.

A great number of instructive film reproductions are added to this article.

H. W. HEFKE, M.D.

**Chondroma of Intervertebral Disk.** Paul C. Bucy. *Jour. Am. Med. Assn.*, May 17, 1930, XCIV, 1552.

A review of the literature is presented, with a report of one case. The majority of cases reported have been in the cervical region; the author's case showed involvement of the disk between the third and fourth lumbar.

The report covers the history, examination, operation, and histologic study of the specimen, and an interesting comment follows. It makes a very comprehensive review of this subject.

C. G. SUTHERLAND, M.D.

**Fracture of the Neck of the Femur: The Importance of Correction of the Outward Rotation of the Leg.** E. B. Mumford. *Jour. Indiana St. Med. Assn.*, July, 1930, XXIII, 316.

A study of the roentgenogram of the normal hip is essential to interpretation of the conditions in the fractured hip. In the normal hip, with leg in position of neutral rotation, the neck of the femur is fairly long, the greater trochanter is some distance from the

rim of the acetabulum, and little of the lesser trochanter is shown. After fracture of the neck of the femur, the femoral angle will be 90 to 100 degrees, instead of the normal 120 to 130 degrees. This is due to abduction of the inner fragment and adduction of the outer fragment. The fractured surfaces are not in contact, and must be brought in contact by correcting the outward rotation of the leg, by bringing the leg (outer fragment) into a position of neutral or slight internal rotation. Abduction alone will not reduce the fracture, but merely corrects the angulation.

W. W. WATKINS, M.D.

**Phalangeal Pseudo-epiphyses. J. Becker. Röntgenpraxis, June 15, 1930, II, 559.**

Beside the pseudo-epiphyses on the metacarpals Becker describes multiple phalangeal pseudo-epiphyses in two children, who had the clinical signs of a Mongolian idiocy, and in another child, who was clinically entirely normal. Such findings are probably not as rare as the lack of reports would indicate, and it would be desirable if the roentgenologist would look more frequently for such changes.

H. W. HEFKE, M.D.

**A New Technic for a Roentgenogram of the Scapula. Rudolf Wahl. Röntgenpraxis, July 15, 1930, II, 652.**

The antero-posterior and lateral roentgenograms of the scapula are not entirely satisfactory. The author describes a technic which appears to show the scapula in its entirety in the X-ray film. The patient lies on his back, with his arm abducted and rotated outward. The X-ray tube is tilted so that the central ray forms an angle of about 130 degrees, with the film under the shoulder of the patient. One could call this technic a lateral-ventrodorsal exposure.

H. W. HEFKE, M.D.

**The Radio-ulnar Synostosis. Hans Hefter. Med. Klinik, Aug. 8, 1930, XXVI, 1184.**

Two types of radio-ulnar synostoses may be distinguished: the congenital type and the

traumatic type. The symptoms of these two types are alike and consist in inability to rotate the forearm. The congenital synostosis may be bilateral and familial, and the knowledge of its existence may be of importance in industrial surgery.

H. W. HEFKE, M.D.

**BONE DISEASES (DIAGNOSIS)**

**Gonorrheal Spurs a Misnomer. William H. von Lackum and Emilio J. Palomeque. Jour. Am. Med. Assn., August 16, 1930, XCV, 472.**

One hundred consecutive cases of exostosis of the os calcis were reviewed. In 6 per cent there was no accompanying pain. Pain, when present, was directed to the heels in 55 per cent, and to the feet in 39 per cent.

A history of gonorrhea was obtainable in only 44 per cent of the cases. In only 2 per cent the onset of pain was a few days to three months from the onset of the gonorrhea. In 56 per cent pain post-dated the gonorrhea by an average of fourteen years. Eight patients without gonorrhea and four patients with gonorrhea also had osteo-arthritis of other joints. Syphilis, as far as could be ascertained, was not an etiologic factor in any of the cases.

A variety of etiologic factors for calcaneal spurs have been commented on by various observers. Neither syphilis nor gonorrhea is a gross factor in the etiology. The term "gonorrheal spurs" is a misnomer and should not be used.

CHARLES G. SUTHERLAND, M.D.

**The Arthritic Complications of Gonorrhea in the Adult Male. James F. McCahey and Leon Solis-Cohen. Am. Jour. Med. Sci., June, 1930, CLXXIX, 782.**

The authors report 28 cases of gonorrheal arthritis, with special reference to the time in the course of the disease at which the arthritis appeared, its chronicity, complications, and functional results.

In only two of this series did the clinical

findings indicate that the prostate was the site of the focal infection. In the other 26 cases the clinical evidence indicated that the seminal vesicles were the site of the focal infection.

In three cases which developed during acute gonorrhea the arthritis was comparatively mild and the vesicles palpable but not hot. In eight cases with typical acute gonorrheal arthritis the seminal vesicles were palpable and hot. The arthritis was bilateral in five cases. Of the acute cases, there were five in which joint disability followed the acute gonorrheal arthritis.

In five cases in which arthritis developed subsequent to apparent cure of gonorrheal arthritis there was infection in the vesicles. In all of these there was some joint disability.

There were seven cases in which arthritis developed after the clinical cure of gonorrhea. All of these cases showed definite infection of the vesicles, but the vesicles were not hot to rectal palpation.

The authors draw the following conclusions: Arthritis due to gonococcal infection of the vesicles differs from arthritis due to non-gonococcal infection of the vesicles only in degree of intensity of the resulting joint lesions. The two types exhibit the same predilection for the larger joints; are both likely to involve several joints, and tend to spontaneous cure of some of the involved joints, with persistence in others.

ROE J. MAIER, M.D.

**Fragility and Deficient Healing of Bone in Poliomyelitis.** I. Harrison Tumpeer and R. W. McNealy. *Jour. Am. Med. Assn.*, July 5, 1930, **XCIV**, 19.

In a paralyzed member, bone atrophy runs parallel with the muscle-wasting and proceeds with modification in the size of the vessels of the region and the structure of the subcutaneous tissues. Two cases are reported in which atrophy, tendency to fracture and regeneration were all related to the poliomyelitic lesion.

The authors come to the following conclusions: (1) Bone atrophy in poliomyelitis is

indistinguishable from bone atrophy from non-use; (2) atrophic bones are easily fractured; (3) callus formation occurs in fractures of parts affected by poliomyelitis; (4) callus in such parts produces weak union because the functional stimulus is absent.

CHARLES G. SUTHERLAND, M.D.

**Gonorrheal Infection of Bone.** H. E. Bardenwerper. *Jour. Am. Med. Assn.*, April 19, 1930, **XCIV**, 1230.

The author reports a case of gonorrheal infection of bone in a female. Stark reviewed all cases up to 1913 (the reference is given), and rated it as a rare condition. In his own case the author felt that earlier roentgenograms might have saved considerable inconvenience to the patient and worry to the doctor. The end-results seem to have warranted the conservative treatment carried out.

CHARLES G. SUTHERLAND, M.D.

## BONE DISEASES (THERAPY)

**Osteogenesis Imperfecta Tarda (Fragilitas Ossium): Report of Four Cases in One Family.** Morris Gleich. *New York St. Jour. Med.*, July 15, 1930, **XXX**, 850.

Since only bone tissue is affected, it would seem to be due to an impaired bone-forming mechanism in the embryo. In a family composed of a father, mother, and six children, the father and three of the children show evidences of this affliction. Judging by X-ray appearances, rickets, osteogenesis imperfecta, and osteomalacia show similar osseous responses of varying degrees. Perhaps Vitamin D, with diet liberal in calcium, would be of benefit in all of these diseases.

W. W. WATKINS, M.D.

**Osteochondritis of the Growth Centers.** Maxwell Harbin and Robert Zollinger. *Surg., Gynec. and Obst.*, August, 1930, **LI**, 145.

The authors of this article state: "The purposes of this paper are (1) to assemble a re-



view of the literature concerning a disease common to all the centers of ossification of the human skeleton; (2) to simplify and standardize the terminology of this disease, and (3) to present its occurrence in a family of four individuals."

They feel that the pathological entity of osteochondritis, described by Osgood, Schlat-ter, Koehler, Legg, Calvé, Perthes, Freiberg, Scheuermann, Kienboeck, and others as located in particular epiphyses, has a similar or common cause; attaching the name of the early writers has caused confusion in the terminology of the one basic disease. Osteochondritis is divided into two distinct groups, primary and secondary, depending upon whether the primary center of ossification or the secondary center is first involved.

An excellent drawing is shown of the ossification centers, with the ages of appearance and final ossification, with dates indicating when the diseases were first described, and the authors who first reported them. The primary type may continue until the appearance of the secondary centers, or both types may appear simultaneously in the same patient. The disease is limited by complete ossification.

The more common locations are discussed, including terminology, symptoms, roentgenologic findings, prognosis, and treatment. Case reviews of the hip, patella, humerus, and four cases of spine involvement in members of the same family are given. Both primary and secondary types of osteochondritis are represented in the cases of spine involvement, the secondary cases representing the disease in the initial, active, and arrested stages.

The etiology of the disease is unknown. However, direct trauma, or indirect trauma as a result of increased stress and strain from the body forces, appears to play an important rôle. Heredity may be considered as a possible etiological factor as considered by Hanson and represented by the authors' series of four members in one family having involvement of the spine. Leriche and Policard offer an explanation from vasomotor changes based on the reflexes of the traumatized axone. Perhaps a combination of the factors, added to

some unknown cause, may be found to be responsible for this disease.

The treatment varies according to the location of the disease. In general, a period of physiological rest of from four to six weeks is essential. When plaster supports are dispensed with, some mechanical device may be used to prevent recurrence of the deformity until the period of active growth of the center involved is over. It is thought that chronic arthritis may develop in the involved areas in later years.

D. S. CHILDS, M.D.

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**Diabetes Insipidus and Osteitis Fibrosa Polycystica.** Abraham Sophian. *Jour. Am. Med. Assn.*, August 16, 1930, XCV, 483.

This is a report of a case, with a short review of the literature. Interesting observations have appeared in the literature on the relationship of parathyroid disease (hyperparathyroidism) to generalized bone disease, and notably to osteitis fibrosa polycystica. Most writers agree that hyperparathyroidism produces a hypercalcemia, the calcium being extracted from the bones, thereby producing bone disease. In turn, there is excessive excretion of calcium, and metastatic calcium deposits have been found in the lungs, kidneys, stomach, heart muscle, and thyroid.

Improvement in the bone decalcification has been reported by some observers after the removal of parathyroid tumors. The only specific remedy is pituitary extract, which controls the polydipsia but has no effect on the bone lesions.

CHARLES G. SUTHERLAND, M.D.

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#### BONE TUMORS (DIAGNOSIS)

**Multiple Myeloma.** C. T. Burnett and W. C. Johnson. *Colorado Med.*, June, 1930, XXVII, 178.

The early sites of involvement of this neoplasm are the flat bones, ribs, and vertebrae, extending later to other organs. The early clinical symptoms are rheumatic pains, often ascribed to neuritis, aggravated by exertion. Often a spontaneous fracture will be the first



suggestion of bone involvement. The condition must be differentiated from osteitis fibrosa and metastatic malignancy. Myeloma occurs usually in older persons, being a slow-growing multiple lesion of the flat bones which produces sharply outlined focal spots of destruction. The X-ray appearances may be indistinguishable from those of metastatic malignancy. A pathological examination of a section of the bone removed for biopsy may be done.

A case record, with autopsy findings, is included in the paper.

W. W. WATKINS, M.D.

**Osteitis Fibrosa Cystica, Generalized Type, with Giant-cell Sarcoma.** Benjamin M. Joseph. *Am. Jour. Dis. Child.*, July, 1930, XXXX, 81.

Cases of this condition have been noted in the literature since 1840. Von Recklinghausen gave his classic description of the disease in 1891, at which time he reported three cases. Morton's division of the cases into two groups is as follows and has proven to be valuable: (1) cysts without giant-cell sarcoma, (2) cysts with giant-cell sarcoma.

The author describes a case of osteitis fibrosa cystica in a child thirteen months of age. The rapidity with which the lesions became evident was most striking. The first series of roentgenograms demonstrated involvement of the right mandible, skull vault, and distal portions of the femora. Five weeks later there was definite extension of the cystic condition in the femora, and within two months the entire skull vault, clavicles, ribs, humerus, iliac and pubic bones, femora, and tibiae were involved. There was a severe anemia present. The histologic diagnosis was metastatic large round- and giant-cell sarcoma.

The changes in the contour of the long bones, the widening and irregularity of the cortex and marrow cavity, the translucent shadows of honey-combed appearance in the cystic areas, lack of involvement of the joint surfaces, epiphyses, and periosteum are considered the main characteristics essential in the roentgen diagnosis of the condition. In

the roentgenograms shown by the author, there was noted definite periosteal elevation in the femora.

The etiology of the condition is somewhat obscure. Trauma, toxicity, and disturbance of the internal secretory organs have all been considered. Erdheim believes that parathyroid disease is a strong etiologic factor. The condition is certainly unusual in children.

F. B. MANDEVILLE, M.D.

**A Contribution to the Knowledge of Chondromatosis.** Helmut Stark. *Röntgenpraxis*, Aug. 1, 1930, II, 717.

A woman forty-three years of age presented very marked chondromatosis through almost the entire skeleton. The typical roentgenologic appearance is described. Calcification of the cartilaginous tumors is rather marked, but the tendency to further growth and the possibility of sarcomatous degeneration make the prognosis rather doubtful, in the author's opinion.

H. W. HEFKE, M.D.

**Hereditary Deforming Chondrodysplasia: Report of a Case.** Olan R. Hyndman. *Arch. Surg.*, July, 1930, XXI, 12.

This condition has been commonly referred to as multiple cartilagenous exostoses and has been described under various other names. It is hereditary and familial, having been traced through five generations in several instances. A definite etiological factor has not been established, but certain facts are well known. Cartilage rests are left in the wake of a chaotic advancing epiphysis and these rests undoubtedly form the nucleus of the anomalous benign tumor. Nearly all the bones of the body, with the exception of the skull, are involved.

There is often a disproportionate development of the bones of the forearm and of the lower leg, the ulna and fibula being considerably shortened and distorted with respect to the radius and tibia. The tumors vary in their bone content, but are practically always less dense than the adjacent normal bone. They

are centrally located and expand the cortex, in some respects resembling giant-cell tumors of bone. Cases of malignant degeneration of enchondromas have been reported in the literature, but comprise only about 5 per cent of these hereditary cases.

The author does not believe in a possible kinship of chondrodystrophia fetalis and hereditary deforming chondrodysplasia. He reports one case in detail.

HOWARD P. DOUB, M.D.

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**Hereditary Deforming Chondrodysplasia or Multiple Exostoses: Report of a Father and Two Daughters Showing Similar Multiple Symmetrical Exostoses, and Fifty Other Cases Collected from the English Literature Since 1917.** Kelley Hale. *Ann. Surg.*, July, 1930, XCII, 92.

The author reports in detail three cases of multiple exostoses occurring in a father, 58 years of age, and two daughters, 18 and 15 years of age, respectively. A third daughter and a son presented normal skeletal development.

The various possible etiologic factors are discussed at length. Several theories advanced by authors who have reviewed the literature, are considered. Hale states that in the three cases studied by him, heredity unquestionably exists as an etiologic factor, and he adds, "Multiple exostoses may be due to impressions made upon the germ plasm consequent to fractured bones and their complex healing processes in past generations." In proof of his evolutionary theory, he presents statistics of a series of fractured bones in his own practice.

In Ollier's disease, the shortening of the extremities affects only one side of the body, while in chondrodysplasia it is generally symmetrical. Hale believes that a few years' study into the geneology and offspring of this small group of individuals would clear up the much disputed point of whether or not Ollier's disease is a distinct clinical entity.

F. B. MANDEVILLE, M.D.

## BONE TUMORS (THERAPY)

**Treatment of Osteogenic Sarcoma of Long Bones.** W. H. Gibbon. *Jour. Iowa St. Med. Soc.*, July, 1930, XX, 297.

Many investigators, notably Bloodgood, Coley and Eissing, have considered irradiation of little or no benefit in these cases, and the question naturally arises as to the reason for this attitude. Radiation is still in its infancy, and from results which are available it would seem that roentgen-ray therapy is of distinct value in the treatment of osteogenic sarcoma, preliminary to surgical removal, as evidenced by definite prolongation of life in the irradiated cases when compared with the non-irradiated cases. Five-year cures are possible, even when metastases are present, as illustrated by a case cited.

W. W. WATKINS, M.D.

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**Statistical Review of Tumors of the Limbs Observed in Rizzoli's Orthopedic Institute during the Years 1927-1928.** Giulio Faldini and Oscar Scaglietti. *Rivista di Radiologia e Fisica Medica*, March, 1930, II, 265.

This is a review of thirty-two cases of the limbs seen in Rizzoli's Institute and includes notes on the treatment and radiographic and anatomic findings in these cases. Four benign tumors were treated surgically; ten metastatic lesions had radiotherapy, usually with resulting relief of pain; of eighteen malignant tumors three were extirpated surgically, the others, after surgical removal, had prophylactic roentgen treatment locally and to the lungs. Three cases had Coley's toxins without subjective or objective change.

E. T. LEDDY, M.D.

## CANCER (DIAGNOSIS)

**Cancer of the Stomach.** Ralph H. Chaney. *Jour. Med. Assn. Georgia*, June 1930, XIX, 222.

This is a fairly detailed description of stomach cancer, covering various phases. From the

standpoint of diagnosis, any individual over forty years of age who comes with a complaint of dyspepsia, biliousness, or indigestion should be suspected of cancer until it is ruled out. Likewise, no case should be allowed to run along with a single examination following a persistent loss of weight, but should have frequent check-up studies by X-ray, gastric analyses, examination of the stools for occult blood, and weighing. The most valuable single aid in the diagnosis of gastric cancer is the roentgen-ray study. The characteristic cases show definite findings, ulcers having diameters of more than 2 cm. being malignant three times out of five. When characteristic X-ray findings exist, clinical signs are present in 91 to 95 per cent of the cases, these being indicated by changes in gastric contour in 93 per cent, by the presence of a mass in 73 per cent, and by variation in the gastric acids in 88 per cent.

W. W. WATKINS, M.D.

**The Impending Developments in the Diagnosis and Treatment of Cancer.** Francis Carter Wood. *Ohio St. Med. Jour.*, July, 1930, XXVI, 589.

Not over 20 per cent of the persons applying for relief to a large private hospital are operable or capable of receiving effective treatment by X-ray or radium; and of the 20 per cent who are operable, scarcely more than 5 per cent obtain what we call a cure. That is why the death rates from cancer mount steadily. It is astonishing how ignorant the people are regarding the therapeutic resources for cancer. The disease should be made notifiable, so that people may be instructed through the proper channels, instead of being misinformed by the ignorant. The profession must learn to seek the best possible aid in treatment, instead of following personal loyalties. There should be institutions in every large community where cancer patients can be treated by the best surgical and special skill available. While every case of cancer cannot be referred to such an institute, as is the case in Sweden, both the public and the profession

would gradually learn to refer their patients where they could best be treated by surgery or radiation.

W. W. WATKINS, M.D.

**The Cystic Carcinomatosis of the Skeleton and Several Other Types of Generalized Carcinomatosis of the Skeleton in the Roentgen Picture.** H. Meyer-Borstel. *Röntgenpraxis*, July 1, 1930, II, 604.

Four different types of generalized carcinomatosis of the skeleton are described, each one of which gives an entirely different X-ray appearance, according to the predominance of osteoclastic or osteoplastic bone processes. Generalized cystic carcinomatosis of the skeleton is rarely observed. Its diagnosis may be very difficult, as other cystic bone diseases may give the same picture (multiple myeloma, osteitis fibrosa cystica). The generalized purely osteoplastic type of metastasis is sometimes hard to differentiate from a genuine osteosclerosis (Albers-Schönberg's marble bones), while the mixed types with osteoplastic as well as osteoclastic processes usually do not present any differential diagnostic difficulties. A very marked contrast may exist between the extension and severity of generalized bone metastases and the good general condition of the patient, so that the clinician often does not think of a generalized metastatic bone involvement.

H. W. HEFKE, M.D.

**Contribution to the Clinical and Roentgenological Diagnosis of Lung Carcinoma.** Karl Herman. *Wien. klin. Wchnschr.*, July 17, 1930, XLIII, 910.

While the clinician could make a definite diagnosis of lung carcinoma in about only 2 per cent of the cases twenty years ago, one can do so to-day in about 70 per cent. This remarkable progress is mostly due to the modern roentgen diagnosis. In questionable clinical and roentgenologic cases, one should use the bronchoscope and sometimes rely on the reaction of questionable lung tumors to ther-

apeutic doses of X-rays, in order to make a differential diagnosis.

Twelve cases are described, with clinical and roentgenologic findings.

H. W. HEFKE, M.D.

### CANCER (THERAPY)

**Report on the Results of the Genital Carcinomas Operated on and Irradiated during the Period from 1917 to 1927, and on the Cure of a Case of Vaginal Sarcoma in a Child.** Anselm Reisach. *Strahlentherapie*, 1930, XXXVII, 341.

During the period from 1917 to 1924, 178 cases of inoperable carcinoma of the cervix were seen in the author's clinic. Sixteen remained untreated and they all died; thirty-two received only radium treatment and all patients died; 130 cases received radium and roentgen rays combined (12 were still alive after five years). This corresponds to a relative cure in 10 per cent. Fifty operable cases of carcinoma of the cervix were treated by irradiation; 12 of these patients were still alive after five years, corresponding to 24 per cent cures. Sixty cases were operated on and then irradiated. The primary mortality was 10 per cent, with 35 per cent cures after five years. Twelve cases were treated by amputating the cervix, followed by X-ray and radium. Eight died and 4 are still alive after five years. From a total of 300 cases of operable and inoperable carcinoma of the cervix, 15 per cent were well following operation or irradiation after the five-year period. A statistical survey is also given of the cases seen during the period from 1925 to 1927. It appeared from the three years' observation that the majority of deaths due to recurrence take place during the first three years. Since the mortality of the operation rises considerably if borderline cases are included in the operative list, the author prefers stricter indications for surgery.

During the period from 1917 to 1925, 9 carcinomas of the fundus were seen, 6 of which were operated on and 3 were treated by X-ray and radium. Four of the cases operated on and 1 of the irradiated cases were free of recurrence after five years. During the same

period, 33 cases of carcinoma of the ovary were admitted, 2 of which were free of recurrence after five years, 1 following operation and 1 following irradiation. Of the 12 cases of carcinoma of the vulva, all died (1 patient after five years and three months). There were 9 cases of carcinoma of the vagina, 2 of which were free of recurrence after five years. These were treated by excision of the tumor, followed by radium and roentgen therapy.

In conclusion, the history of a two-year-old girl is briefly related, who had a pedunculated sarcoma of the vagina. This was removed, followed by intravaginal radium application. The patient is still free of recurrence three years following the treatment.

ERNST A. POHLE, M.D., PH.D.

**The Care of Carcinoma Cases in Schleswig-Holstein.** Rob. Schröder. *Strahlentherapie*, 1930, XXXVII, 378.

**Medical Education in the Fight Against Carcinoma.** W. Lahm. *Strahlentherapie*, 1930, XXXVII, 386.

**The Rôle of Radiation Therapy in Social Gynecology.** Wilhelm Liepmann. *Strahlentherapie*, 1930, XXXVII, 402.

In these three papers, problems of the fight against carcinoma are discussed from the viewpoint of State administration, of medical post-graduate education, and from the economic standpoint.

ERNST A. POHLE, M.D., PH.D.

**The Treatment of Cutaneous Malignancies.** Harry R. Foerster. *Wisconsin Med. Jour.*, July, 1930, XXIX, 361.

There is no therapeutic measure of preference in the treatment of skin cancer, generally applicable. Surgery, electrothermic surgery, radium, and X-rays are all applicable. Success in treatment necessitates an intimate knowledge of the various measures, judgment in the method of choice, and experience and skill in application. The types of lesions include the locally malignant (*e.g.*, the basal-cell), and the generally malignant or metastasizing (*e.g.*, the prickle-cell). In basal-cell



epithelioma, X-rays and radium give the best results and should have preference; if supplementary treatment is required, endothermy is best. Early lesions of the squamous-cell type are usually successfully treated by radiation, but advanced lesions require electrothermic destruction in addition. Epitheliomas of the mucous membranes or at the mucocutaneous junction are best treated with radium, unless infected, when they are best treated by surgical or combined methods. Nevocarcinomas require wide excision with scalpel or surgical endothermy. Destruction by endothermy, even when considered complete, is preferably followed by X-rays or radium in dosage sufficient to destroy any remaining cancer cells.

W. W. WATKINS, M.D.

**Cancer of the Lip, Tongue, and Skin: A Statistical Inquiry.** Janet Lane-Claypon. *Lancet*, Aug. 2, 1930, CCXIX, No. 5,579, p. 260.

These statistical inquiries were made by the author and published as No. 59 of the Reports on Public Health and Medical Subjects issued by the Ministry of Health. In considering treatment the percentage of results is mostly set out in the form of two different survival-rates, the crude and the net. The crude rate regards all cases not definitely known to be alive and well as having died of cancer, and gives too unfavorable a result. In calculating these rates no patient has been included among the living, who, though alive, was known to have a recurrence of the disease. A survey of the literature on operability of cancer of the lip shows that only 10 per cent of the patients who apply for the treatment are in an inoperable stage. Operative mortality is not a serious factor, except in advanced cases where removal of bone is necessary. The net survival-rates are 29.4 per cent for five years, and 58.4 per cent for three years. In cases in which the glands were removed the survival-rate was 80 per cent, and there was no great difference between the three-year and five-year rates, for 90 per cent of recurrences take place within three years. For all stages of the disease and for all methods of radiotherapy, the survival-

rate was 76.1 per cent at three years after treatment. The results of treating recurrent cases are good enough, either by operation or by radiotherapy, to make treatment worth undertaking.

Cancer of the lip takes a slow course if it is not treated, and there are cases on record in which the symptoms had been present for thirty-six years. Most patients report for treatment within one year of the onset of symptoms. The lower lip is more often involved, the proportions being 95 to 5. It occurs twelve to fourteen times more often among men than among women, but women are more apt to have cancer in the upper lip. The average age of application at hospitals is 57 years, and the average age at death is 70 years. Metastases are rare. The data which have been collected do not support the common belief that smoking has an etiological relationship to cancer of the lip. In 184 cases investigated, roughly one-quarter were affected with cancer at the place where they held their pipes. The commonest precursory lesions are blebs and ulcers.

The literature on cancer of the tongue was found to give unsatisfactory data for the purposes of the report, and the results are to be considered as only relatively accurate. Apparently from 20 to 25 per cent of all patients operated on are alive and well three years later, but the true survival-rate is probably somewhat higher than this. The operative mortality rate varies from 7 to 12 per cent. The examples available suggest that radiological treatment shows a better survival-rate than operation—37.8 per cent and 59 per cent in a small group from the Radiumhemmet, Stockholm. The disease, on the whole, has a short natural duration, about sixteen months. Patients usually apply for treatment seven to eight months after the appearance of symptoms, and delay is all the more serious in that the disease has such a short natural period and disseminates so rapidly. It reaches glands early in its course, and most surgeons prefer to treat them as part of the routine. The mean age of occurrence is 54 years, and of death is 61. Cancer of the tongue is about ten times as common among men as among wom-



en. The commonest antecedent condition recorded is syphilis. There is also a close relationship to leukoplakia, with or without previous syphilis. There are no accurate data of the supervention of cancer upon syphilis. So far as the figures go, there is no definite association between smoking and cancer of the tongue, and while the jagged edge of a tooth seems to have been an exciting cause in a few cases, statistics dealing with dental abnormalities are too scanty to be worth consideration. In some parts of the East—but not in other parts—betel-chewing seems to produce cancer of the mouth, and the literature does not indicate whether the difference is due to some variety in the composition of the quid or to different habits of chewing.

There is a wide variation in survival-rates of cancer of the skin, but on the whole it appears that from 40 to 50 per cent of all patients treated are alive and well three years after operation, and there is little doubt but that adequate radiologic treatment will give a figure of from 80 to 90 per cent. Despite differences of opinion the results appear to be more favorable with basal-celled than with squamous-celled cancers. Radiotherapy gives good results with relapsed cases. The disease takes a long course, the average period between the appearance of symptoms and the application for treatment being ten years. Less than 25 per cent of patients apply within a year. Most lesions occur in the upper part of the head and face, and the majority of these are basal-celled, invading the glands very slowly, if at all.

A few cases of sarcoma have been unavoidably included. Radiotherapy seems to give good results in sarcomata and melanotic sarcomata. Men and women are affected about equally, with a slight preponderance among men. The mean age varies between 55 and 58, and the mean age of death is 66 for men and 68.7 for women. The precursors are blebs, crusts, warts, pimples, scabs, nodules, or injuries. It seems reasonably certain that a high percentage, if not all, of cancers of the skin, develop on a previously existing lesion, and that many of them are caused by frequent irritation. The relationship of occupation to cu-

taneous cancer has been exhaustively investigated, chimney-sweeping and mule-spinning being the two occupations which show a high percentage of deaths from cancer of the scrotum. There is insufficient evidence for laying much stress on the relationship of the disease to climate, whether to cold, heat, or general exposure.

Cancer of the penis and scrotum form a large part of all deaths attributable to cancer of the skin. The results of treatment of cancer of the penis are very satisfactory, but there are no data available from any general hospital in England. Statistics from abroad show that the crude survival-rate after three years is 47.4 per cent, and after five years 41.1 per cent. It is probable that the results of radiotherapy are as good as those of surgery, although there are no large series to be studied. The average period from onset of symptoms to treatment is 14 months, and the interval is often extended to two years by preliminary ineffective treatment at home. There is a high proportion of cases showing enlarged but not yet cancerous glands. Visceral metastases are rarely found. The mean age is between 52 and 54 years. Phimosis seems to be a common antecedent and venereal disease was present in 28.4 per cent. The disease is undoubtedly less frequent among the circumcised. The results of local treatment of cancer of the scrotum are satisfactory; no series treated by radiotherapy is available. The only large series of cases of cancer of the vulva is that published from Radiumhemmet, where the latest method is electrocoagulation combined with radium at a distance. Of 60 cases so treated, 19 were alive and well three years later.

H. J. ULLMANN, M.D.

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**How can we Improve our Results in the Treatment of Uterine Carcinoma? Hellmut Kamnicker. Wien. klin. Wchnschr., July 24, 1930, XLIII, 943.**

Reviewing the results of the treatment of about five hundred cases of carcinoma of the uterus, the author concludes that irradiation alone or operation alone leads to worse results

than the combination of both. Of the operable cases, 44.7 per cent lived after five years. The vaginal operation has a primary mortality of about 7 per cent. The prophylactic roentgenotherapy after operation showed 16 per cent more cures in five years than the non-irradiated group. Early treatment of recurrences by radium and roentgen rays improves the results in these patients. Inoperable cases receive only radium and roentgen treatment, with definite benefit and some cures.

H. W. HEFKE, M.D.

**Distant Metastasis in Carcinoma of the Cervix of the Uterus. Frances A. Ford. Minnesota Med., July, 1930, XIII, 489.**

In treating carcinoma of the cervix or fundus of the uterus by irradiation, attention is usually directed to the primary site of the disease, under the assumption that distant metastasis is rare. In 564 postmortem examinations of cases in which cervical carcinoma was present, Schonberg found metastases in the liver in 13.7 per cent, lung in 4.07 per cent, in the peritoneum in 7.44 per cent, etc. In a study of twenty-four patients with uterine carcinomas, thirteen of whom had metastasis to the lungs and fourteen to the bones, a thorough study is presented. The author concludes:

"(1) Metastasis to distant regions, from carcinoma of the cervix and fundus of the uterus, occurs more frequently than is ordinarily assumed.

"(2) Pulmonary metastasis often is not accompanied by distressing symptoms, so that only by frequent roentgenographic examinations is it detected in the early stages.

"(3) The presence of metastasis in bones often is overlooked because of complicating circumstances which may account for pain. Metastasis to the extremities or skull often is mistakenly attributed to inflammatory destructive lesions.

"(4) Some relief of pain may be secured by effective irradiation of metastatic growths in bone from carcinoma of the uterus. This response seems less definite and less pro-

longed than that obtained in secondary growths from carcinoma of the breast.

"(5) There are not sufficient clinical data to warrant an opinion as to the radiosensitivity of pulmonary metastasis from uterine carcinoma. From the standpoint of greater precision in the application of radiotherapy, a fair trial of such treatment in well selected cases should be made."

W. W. WATKINS, M.D.

**Operation and Irradiation in Carcinoma of the Uterus. W. Weibel. Strahlentherapie, 1930, XXXVII, 302.**

The author demonstrates the many difficulties presenting themselves when comparing the statistics of different clinics. Too many methods are used in treating carcinoma, and the grouping as well as the evaluation of the cases is not uniform. He pleads for the trial of one single method to be used in a number of large clinics; after ten years, it would be possible to answer the question as to the comparative efficacy of operation and irradiation and irradiation alone.

In his own clinic, the author is still operating on all operable cases by carrying out either the abdominal or vaginal hysterectomy. Following operation, all patients are subjected to roentgen treatment in spite of the absence of recurrence, continuing once or twice for several years. All inoperable cases are treated by X-rays and radium combined. In carcinoma of the fundus, operation is the method of choice.

ERNST A. POHLE, M.D., PH.D.

**The Single Massive Dose in the Treatment of Carcinoma. G. Miescher. Strahlentherapie, 1930, XXXVII, 17.**

**The Fractional Dose Method. Hans R. Schinz. Strahlentherapie, 1930, XXXVII, 31.**

Miescher demonstrates in this report his experience with the single massive dose method in the treatment of skin carcinoma. It appeared that both basal and squamous cell carcinomas respond to a single exposure only if

a certain minimum dose is given, which lies in the neighborhood of from 1,200 r to 1,500 r. According to the depth of the lesion, filters of from 0.5 mm. to 1.0 mm. Al or Zn were used. Eighty-nine per cent of the basal and 75 per cent of the squamous cell carcinomas were cured with one single treatment; additional therapy increased these figures to 94.5 per cent and 80.4 per cent, respectively. Tables demonstrate the results in detail. The limitation for the applicability of the massive dose method lies in the tolerance of the tissue. Even from 1,200 r to 1,500 r, given over a large field, leads to reactions which may easily become serious. The same reasoning renders the use of this method unsuitable for use in other organs than the skin.

Schinz outlines a method of roentgen therapy in the treatment of malignant tumors which has been developed recently in his clinic. It intends to imitate the effect of radium by using protracted fractional doses. The involved area is irradiated once or twice daily, applying one-third E.D. in from one to two hours' treatment time. The filter is from 1 mm. to 3 mm. Cu, the F.S.D. 60 cm. to 100 cm.; fourteen exposures are given in about sixteen days. The skin reaction is similar to the radio-epidermitis described by French authors.

Histological studies have brought out the fact that the connective tissue is not much injured by this method of application, in spite of the high total dose administered. A number of cases are reported in which this procedure has been used to advantage.

While no final conclusions are possible at the present time, Schinz feels that the protracted fractional dose method appears to be promising in the treatment of malignant disease.

ERNST A. POHLE, M.D., Ph.D.

**Primary Carcinoma of the Maxillary Antrum.** Charles E. Stone. *Jour. Indiana St. Med. Assn.*, July, 1930, XXIII, 315.

So far it has been impossible to apply primary radiation to neoplastic growths in the maxillary antrum. It is essential that all the

malignant tissue should be removed surgically, depending on subsequent radiation to clean up whatever may have escaped the surgeon. The practice at different clinics varies, but the value of radium in supplementing the efforts of the surgeon admits of no question. At the Mayo Clinic the tumor is destroyed by slow heat, with soldering iron, after which radium is introduced directly into the antrum, either immediately or from ten days to two weeks later.

W. W. WATKINS, M.D.

**The Choice of the Treatment Method in Carcinoma of the Cervix, Based on Clinical and Pathologic-anatomical Classification.** S. Recasens. *Strahlentherapie*, 1930, XXXVII, 266.

Recasens, who holds the Chair of Gynecology and Obstetrics at the University of Madrid, briefly discusses the indications for operation or irradiation in carcinoma of the cervix. At present, he believes that all operable cases should be subjected to surgery following pre-operative radium treatment, since this increases the percentage of cures by 8 to 10 per cent.

ERNST A. POHLE, M.D., Ph.D.

**Recent Work on the Cancer Problem.** Joseph C. Bloodgood. *West Virginia Med. Jour.*, July, 1930, XXVI, 410.

This is a review of the work now in progress in European cancer laboratories, based on a recent tour of Europe. Work on the cause of cancer is still being conducted along the line of carcinogenic agents by Ernest L. Kennaway in London. The work of Otto Warburg on the metabolism of tumor cells has aroused considerable interest and controversy. No experimental support has been given the theory that cancer begins as a general systemic disease. Nothing new has been added to the diagnosis of malignancy in general, although investigation into serum diagnosis is still being conducted. Biopsy and the use of the frozen section is not as widespread in Europe as in America. At the Cancer Hos-

pital in London, as at Johns Hopkins, search for a differential cancer stain is being conducted. Investigation for cancer cure is widespread. Radium has had a distinct rise in popularity in Europe, as well as in America. Treatment by colloidal lead has been abandoned. Attempts to immunize against cancer are being tried in Germany and in England.

W. W. WATKINS, M.D.

**Should the Operable Carcinoma of the Cervix be Treated by Surgery or by Irradiation? R. Hubert. *Strahlentherapie*, 1930, XXXVII, 334.**

Between 1920 and 1929, 397 cases of carcinoma of the cervix were admitted to the author's clinic. Indications for the proper treatment were decided by one man, namely, the head of the clinic. Thirty-eight per cent of the patients were found operable; in 103 cases the radical operation of Wertheim was carried out. The primary mortality amounted to 12.6 per cent. Since some types of carcinoma of the cervix are refractory to irradiation, all operable cases were treated by surgery. In the presence of extragenital complications, for instance, heart lesions, radiation therapy is to be given the preference. Young carcinoma patients, cases of adenocarcinoma, and patients in poor financial circumstances are operated on, as a rule, even if the risk of operation is higher than usual. This social indication for operation is explained by the fact that the patients in poor circumstances do not return regularly for the required series of treatments.

ERNST A. POHLE, M.D., PH.D.

**Utilization of Immunity in Treatment of Cancer. J. C. Mottram. *The Lancet*, May 3, 1930, CCXVIII, No. 5,566, p. 961.**

As the treatment of cancer by removing some of the tissue, irradiating it, and re-injecting it into the patient in order to produce an immunity, has been advocated and carried out on patients, the author thought it desirable to try this treatment experimentally on tumors produced by tar in mice. He quotes

Woglom's review of the literature in the introduction to the paper to show that all treatments of patients, based on experiments with inoculated cancer, are open to the criticism that human conditions are not reproduced in inoculated cancer, but as it is possible to carry out experiments with spontaneous tumors in animals, as the author has done, trials of this method on patients are not justifiable until the animal experimentation has been finished and the method shown effective. The experiments tried were entirely negative. There was no influence on the growth of these spontaneous tumors after inoculation of sections of the irradiated tumor. Therefore, the author concludes that the results obtained with inoculated cancer do not justify the treatment of cancer patients in a similar manner.

H. J. ULLMANN, M.D.

**Cancer of the Breast. Moses Behrend. *Med. Times*, July, 1930, LVIII, 214.**

A lump found anywhere in the breast should always be removed. Before any operative procedure, the patient should be given X-ray therapy and radiographs made of the lungs and long bones if there is any suspicion of them. X-ray treatment should always be used after operation for malignant tumors of the breast.

W. W. WATKINS, M.D.

**On the Results of Radiation Treatment in Inoperable Carcinoma of the Cervix. Walther Schmitt. *Strahlentherapie*, 1930, XXXVII, 322.**

In the author's clinic, 163 inoperable carcinomas of the cervix were irradiated between 1913 and 1923. Seventy-seven women were treated with radium, and eight of these, or 10.4 per cent, were still well after five years. Seventy-two women were treated by radium and X-rays, and six of these, or 8.3 per cent, were still alive after five years. Fourteen women were treated by X-rays alone, and none of them survived after five years. The percentage of cures in the entire group was, therefore, 8.58 per cent.



During the same period 120 cases of carcinoma of the cervix were treated by surgery. Forty-eight of these patients remained well after five years, corresponding to 40 per cent. The total number of cases, operable as well as inoperable, during that period amounted to 305 patients, 20.3 per cent of whom were cured by operation or irradiation. This is the absolute percentage of cures based on all cases without deductions.

ERNST A. POHLE, M.D., PH.D.

**Lesions Originating in the Mucous Membrane of the Mouth. C. J. Broeman. West Virginia Med. Jour., June, 1930, XXVI, 339.**

Were it not for the fact that so many lesions in the mouth are likely to become malignant when neglected, the care and diagnosis of these lesions would not be of such vital importance. The author discusses a great variety of lesions found in the mouth, and the necessity for careful diagnosis. In epithelioma of the mucous membrane of the mouth radium is the treatment of choice, with cautery or diathermy used in conjunction; the adjacent glands should be irradiated. For epulis, radium, surgical diathermy, or cautery may be used. Carcinoma of the tongue should be treated with radium. All forms of treatment should cause as little destruction as possible, and should, preferably, consist of a single application rather than a series of applications.

W. W. WATKINS, M.D.

**The Results of the Treatment of Uterine Carcinoma from 1918 to 1930. Rud. Th. v. Jaschke. Strahlentherapie, 1930, XXXVII, 293.**

Between 1918 and 1930, 318 cases of carcinoma of the uterus (223 in the cervix and 75 in the fundus) were treated in the author's clinic. Of the 223 cases of carcinoma of the cervix, 64.5 per cent were operable (140 women were operated on). Only 130 cases could be observed for five years or longer. In these 130 patients, the operability was 58.4 per cent; 32 were cured, corresponding to an absolute

permanent cure of 23.8 per cent. Seventy-five of the 130 patients had been observed more than five years, and of these, 25, or 33 per cent, are still well. Forty per cent of the total number of patients were admitted to the clinic in a condition which rendered the prognosis almost hopeless. The author operated on every case possible, followed by X-ray deep therapy to the pelvis.

Eighty-three cases were treated by irradiation alone; 55 of these could be observed more than five years. Five of the 55 patients, or 9 per cent, are still well. This poor result of radiation therapy is explained by two facts: one is that all operable cases went to the surgeon, and the other is the lack of co-operation of the patient. The women whose condition was improved following the first application of radium did not return for the next treatment. A few months later, they had to come back with a recurrence.

Of the 95 cases of carcinoma of the fundus, 67 were operated upon, 45 women being observed over five years. Twenty-three patients, or 50 per cent, are still well.

Thirteen cases were irradiated; 11 with radium; 2 with X-rays and radium. After five years, 5 are still alive. No definite conclusions are drawn, however, in view of the small number of cases.

The author emphasizes, in closing, that in order to improve the results, an organized educational campaign among the people is essential.

ERNST A. POHLE, M.D., PH.D.

**Résumé of the Principles of X-ray Technic in the Treatment of Deep-seated Carcinoma. H. Coutard. Strahlentherapie, 1930, XXXVII, 50.**

Coutard discusses briefly the principles of roentgen therapy in malignant disease as developed in the Curie Institute in Paris, and which are familiar to the American radiologist. He states that the protracted fractional dose method permits the application of high doses without seriously injuring blood vessels and lymphatics. As long as we do not obtain a high percentage of cures in superficial car-



cinoma, he feels that it is futile to expect many cures by roentgen rays alone in the treatment of deep-seated malignancies. This does not exclude, however, the excellent palliative results which have been observed.

ERNST A. POHLE, M.D., PH.D.

**Why and within what Limits is it Necessary to Use Inhomogeneous Irradiation in the Radium Treatment of Carcinoma?** W. Lahm. *Strahlentherapie*, 1930, XXXVII, 79.

It is stated that the central part of the tumor or the area from which it started to grow requires much higher doses of radiation for a successful treatment than does the peripheral or younger tissue. Inhomogeneous irradiation is, therefore, indicated. This is illustrated in detail, for instance, in cases of carcinoma of the cervix.

ERNST A. POHLE, M.D., PH.D.

**Combined Therapy in Malignancy.** L. J. Carter. *Canadian Med. Assn. Jour.*, June, 1930, XXII, 837.

This case report illustrates well the good results that may frequently be obtained by a combination of measures in the treatment of malignancy. The report is contributed to the *Canadian Medical Association Journal* as a part of the educative program which the radiologist should employ in spreading information concerning the possibilities of the X-ray among his confrères of the general medical profession.

The case is one of very extensive carcinoma of the alveolar margin of the left upper maxillary bone. The general condition of the patient was very poor, there being extreme cancer toxemia. Five radium needles, of 10 milligrams each, were buried in the tumor for 24 hours. Following this, a series of X-ray treatments of moderate penetration was given over the affected area and the regional lymph glands. Two months later the sloughing area was electrocoagulated and the dead bone removed, followed during the next two months by further X-ray treatments. Five months

later the patient, concerning whom there had been given a most unfavorable prognosis, reported in general a good condition. He stated that some time previously the whole alveolus had come away *en masse*, leaving a clear-edged cavity. On examination this was confirmed, and no evidence of cancer could be seen. Two years later, there is no sign of recurrence, and the patient's general health is good.

#### THE CHEST (DIAGNOSIS)

**Concerning the Roentgen Appearance of Late Congenital Syphilis.** I. J. Balaban. *Röntgenpraxis*, Aug. 1, 1930, II, 709.

The roentgen and autopsy findings of a late congenital syphilis of the lungs are described. Two large, round, well circumscribed shadows in the lungs of a seventeen-year-old girl were diagnosed as echinococcic cysts. The autopsy findings proved them to be two gummas.

H. W. HEFKE, M.D.

**Psittacosis: A Clinical and Roentgenologic Study of Seven Cases, with Postmortem Observations in One Case.** Edwin Peterson, O. B. Spalding, and Otis Wildman. *Jour. Am. Med. Assn.*, July 19, 1930, XCV, 171.

Seven cases were studied and roentgenologic investigation was made in all of them. X-ray films were taken daily, and the progress of the specific creeping pneumonia was carefully noted.

The characteristic features of this specific exudative mass were, first, a small, faint, circular cloud of equal density. Gradually this cloud enlarged, reaching its maximum size and density on the third or fourth day. The exudate occurred at the base of the left lower lobe in every case. The homogeneous density, contour, and location of the exudate differed from that of any pneumonic consolidation previously observed. There was an absence of the mottling of bronchopneumonia. The shadow was less opaque than in a typical lobar pneu-

monia and differed in contour from a typical infarct. A characteristic feature in every case, as the disease progressed, was the migration or creeping upward of the exudate beneath the scapula, leaving normal lung tissue behind.

The tendency of the disease was to jump to the opposite base where it progressed through a characteristic cycle, appearing as a circular cloud, enlarging, increasing in density, and after the fourth or fifth day, starting to creep upward beneath the scapula, leaving clear lung tissue behind.

The roentgenologic observations were the determining factors in the early diagnosis and treatment of the disease.

CHARLES G. SUTHERLAND, M.D.

**Acquired Massive Atelectasis of the Lung.** Clough Turrill Burnett. *Colorado Med.*, July, 1930, XXVII, 226.

Bradford's definition is "a collapse of the lung more or less extensive, where there is no gross lesion such as fluid or air in the pleura to account for its presence." Causes may be (1) bronchial obstruction from inside the bronchus; (2) bronchial obstruction from outside the bronchus; (3) postural effects; (4) paralytic origin; (5) reflex. The clinical types may be post-operative, traumatic, or neither of these. In the X-ray examination, either a fluoroscopic examination or two roentgenograms, one in deep inspiration and one in suspended deep expiration, will be required. The collapsed portion has a density as great as lobar pneumonia, and the mediastinal contents shift to the affected side with inspiration, and away from this side in expiration. Four case histories are given.

W. W. WATKINS, M.D.

**Chest Radiography.** J. G. Edwards. *Med. Jour. Australia*, June 21, 1930, I, 804.

After a practice extending over twenty-three years, involving the examination of over thirty thousand chest cases, the author considers that fluoroscopic examination is of little value in chest diagnosis. Opinions are based

on stereoscopic films taken at from four to six feet. In abscess and hydatid disease, fluoroscopy is employed only for localization.

Eight thousand examinations of miners suspected of silicosis were made, fluoroscopy being abandoned after the first thousand cases, as affording no further information than that obtainable from the films. A well established silicosis gives an X-ray appearance somewhat similar to miliary tuberculosis, but fever is absent, unless an apical tuberculosis is superadded. A tuberculous infection advances at an extremely rapid rate in patients suffering from silicosis.

The importance of examining the nasal sinuses in cases of obscure chest disease, especially in children, is emphasized, as cough is often looked upon as being due to tuberculosis when the sinuses are infected.

J. G. STEPHENS, M.D.

**Pleuroлите or Free Calculus in the Pleural Cavity.** Luis R. Romaguera. *Tuberculosis*, March, 1930, I, 340.

The author reports a case of pulmonary tuberculosis in which, after pneumothorax and phrenicotomy, a free body about the size of a pigeon's egg and of irregular outline was found in the pleural cavity. The shadow cast by it was equal in density to that of the clavicle. Macroscopically, this body was semi-solid in consistency, and its shape changed with the change of position. All the theories that explain the formation of such free bodies are discussed.

M. VIAMONTE, M.D.

**A Report of an Unusual Case of Hemorrhagic Disease of the Newborn.** Gordon Chown. *Canadian Med. Assn. Jour.*, June, 1930, XXII, 837.

An infant four days of age became ill, with difficult and labored breathing. There was definite dullness, with diminished breath sounds over the entire left chest. An X-ray report by Dr. Digby Wheeler showed the heart and great vessels to be displaced to the

right; the right half of the diaphragm normal; the left half obscured. The left chest was completely opaque, suggesting extensive effusion. The chest was aspirated and 60 c.c. of bloody fluid removed, 30 c.c. of the father's blood being given subcutaneously. The following day the effusion recurred, and 45 c.c. was aspirated and another 30 c.c. of the father's blood given. On the same day there was hemorrhage from the umbilical cord.

The case is reported because of the very unusual location of the hemorrhage, and the fact that the clotting time of the blood was normal on all occasions. The child was discharged from the hospital, cured, in ten days.

L. J. CARTER, M.D.

**Tuberculous Pleurisy.** Gerald B. Webb. *Jour. Am. Med. Assn.*, July 5, 1930, **XCV**, 28.

"At adolescence a pleurisy will often have revealed the impregnation of tubercle and it will only be a few years later that the pulmonary localization will manifest itself. In some cases pulmonary disease will light up ten to twenty years later and subjects of pleurisy in youth may not become phthisic until mature or old age."

Tuberculous pleurisy may be acute or chronic. The acute form may be dry or accompanied by a serofibrinous or hemorrhagic fluid. Pleurisy with effusion can persist for a year or more. The condition is not infrequently bilateral. A dry pleurisy may be chronic and persist for years. Following a pleurisy with effusion the original lung focus may, by roentgen study, seem to have disappeared.

Acute tuberculous pleurisy may arise insidiously in children and adults, without pain and at times without apparent fever. In some patients utter exhaustion may precede as well as follow pleurisy. Pleuritic pain may be present when no "rub" can be detected; and on the other hand a loud pleuritic "rub" can be heard, and yet no pain may be experienced. Pain may be referred to the opposite lung. The referred pains of diaphragmatic pleurisy, which occur in the shoulder and in the abdo-

men, are apt to lead to diagnostic errors. With the patient on the affected side, the recumbent diaphragm at first makes an increased excursion and this intensifies the pain of diaphragmatic pleurisy. The symptoms of tuberculous pleurisy may simulate those of pulmonary tuberculosis. Digestive disturbance is most marked when pleurisy with effusion occurs on the left side.

All chest pain and pain referred to the shoulders, arms, and abdomen should suggest pleurisy. In the roentgenogram, any difference in the lighting of the two sides should be noted. From one to three years of a carefully regulated life is necessary to safeguard patients against future pulmonary disease.

Tuberculous lesions in joints and bone appear to have a value in preventing serious lung disease. Possibly an attack of tuberculous pleurisy may render the lungs more immune. Pleuritic disease should be regarded as seriously as pulmonary hemorrhage.

CHARLES G. SUTHERLAND, M.D.

**Roentgen Localization of Intrathoracic Structures, with Report of Findings in Nineteen Cases of Lung Abscess.** Clayton R. Johnson. *Am. Jour. Surg.*, June, 1930, **VIII**, 1237.

The author describes a simple method whereby the dimensions and location of any structure, whether normal or pathological, may be readily calculated. The method is based on the ordinary stereoscopic roentgenograms made for diagnosis of suspected intrathoracic pathology. The technic of making the films is quite simple and consists of films made at a target-to-film distance of 180 cm., and using a vertical shift of 15 centimeters. Metal identification markers should be placed on the upper portion of each film.

The technic used for calculation embraces the following steps:

(1) On one of the films place ink dots on the rib anteriorly and the rib posteriorly at points which lie on a horizontal line with the structure for localization.

(2) Superimpose the two films so that the

markers on the upper corners are exactly superimposed, and see that the right-hand edges of the films are exactly superimposed and parallel. If they are not, then draw a line marking the edge of the overlapping film.

(3) Shift the films over one another in a longitudinal direction with the right margins exactly superimposed until the shadows of the anterior rib marked in Paragraph 1 are exactly superimposed. With a needle perforate both films at the point marked in Paragraph 1.

(4) In like manner superimpose the shadows of the posterior rib and perforate both films at the point marked in Paragraph 1.

(5) Superimpose the shadows of the structure for localization, still keeping the right-hand borders of the films superimposed and parallel, and clip the films together.

(6) Measure the distance in millimeters between the points marked on the anterior rib. This distance multiplied ten times will be the depth of the structure as measured from the point selected on the rib. In like manner the distance may be calculated from the distance selected on the posterior rib.

(7) Measure the distance in centimeters to the right or left of the mid-sternal line if located anteriorly, and from the mid-vertebral line if located posteriorly. The plane dimensions of the structure may be measured directly from the radiograph.

For all practical purposes, an object at a maximum distance of 8 inches from the film, taken with a target film distance of 72 inches, will have a maximum distortion of 10 per cent.

HOWARD P. DOUB, M.D.

**Bronchiectasis.** Paul F. Whitaker. *Virginia Med. Monthly*, July, 1930, LVII, 233.

Bronchiectasis may be brought about intrinsically, as by chronic bronchitis, or extrinsically, as by a pleural effusion. The X-ray is of value in diagnosis. The characteristic picture in a well advanced case is extensive thickening along the course of the lung markings, which is usually seen to radiate from the hilum to the base. There may be considerable difference in the films before and after evacu-

ation of the cavities. In early cases the diagnosis may be very difficult without injection of lipiodol. *Bronchiectasis* must first be differentiated from tuberculosis (history, localization of signs, sputum tests); *chronic bronchitis* (by lipiodol injection); *abscess of the lung* (history, X-ray appearance, diagnostic puncture); *loculated empyema*, and *pulmonary gangrene*.

W. W. WATKINS, M.D.

## THE CHEST (THERAPY)

**Bronchoscopic Observations in Post-operative Atelectasis: Action of Carbon Dioxide.** A. Lincoln Brown. *Jour. Am. Med. Assn.*, July 12, 1930, XCV, 100.

Bronchoscopic observations in cases of proved atelectasis can be grouped into three main types: First, those presenting the generally expected finding of a plugged bronchus; second, a group in which no plug is noted in the bronchus, but in which more or less sputum is found in the trachea or larger bronchi; third, any atypical manifestations that did not fit into the first two groups were placed in this group.

The almost pathognomonic sputum is a thick, viscid, tenacious material of such a consistency that the container may be completely inverted without the mass altering its shape or becoming detached.

An occlusion of the bronchus by an edematous swelling of the mucous membrane was observed, and suggested that atelectasis may arise from causes other than the direct plugging of a bronchus.

The action of carbon dioxide in post-operative atelectasis may be threefold:

(1) There is an increase in the rate and depth of breathing.

(2) This results in approximation of the walls of the bronchi, tending to free any secretion attached to the wall or perhaps to cause a temporary occlusion which in itself would produce violent expiratory effort and thereby tend to expel the retained secretion.

(3) Blanching of the mucous membrane

upon the administration of a moderate concentration of carbon dioxide was distinctly observed.

CHARLES G. SUTHERLAND, M.D.

**Non-tuberculous Bronchopulmonary Infection, from the Internist's Point of View.**  
R. L. Hamilton. *Canadian Med. Assn. Jour.*, July, 1930, XXIII, 30.

One person in fifty operated upon develops some pulmonary complication. These complications comprise the following: bronchitis, suppurative pneumonitis, bronchiectasis, gangrene, or abscess. The infection may gain entrance through (1) extension by lymphatics, (2) aspiration and transplantation, (3) the blood stream, (4) trauma.

All cases should come under the co-operative study of the internist, the radiologist, and the surgical chest specialist. Medical treatment should be adopted in all cases prior to surgical interference.

The main points in the medical treatment consist of pre-operative oral hygiene (since most of the cases are the result of aspiration), rest, good food, fresh air, proportioned exercise, tonic, postural drainage, bronchoscopic drainage, lavage through the bronchoscope, vaccine, arsenic in fusospirochetal conditions, lipiodol, and pneumothorax.

L. J. CARTER, M.D.

**The Prognosis of Pleurisy with Effusion.**  
Fred W. Gaarde. *Jour. Am. Med. Assn.*, July 26, 1930, XCV, 249.

The frequency with which pleural adhesions are found at necropsy and accidentally by roentgenologic examination would indicate that the milder form of pleurisy is common. One hundred and twenty-six cases of idiopathic pleurisy were studied to ascertain, if possible, the factors that influence prognosis.

It would seem that, if the patient survives the original acute attack of pleurisy with effusion, there is a good chance of complete recovery. If he survives the first three years, and particularly the first five years, his chances are excellent for complete recovery.

Idiopathic pleurisy with effusion should be treated as tuberculosis, rather than to allow the patient to return to work when he has recovered from the acute symptoms. The prognosis will be much more favorable.

CHARLES G. SUTHERLAND, M.D.

## CONTRAST MEDIA

**The Diagnosis and Treatment of Bronchiectasis with Lipiodol by the Passive Method.** J. C. Gant and J. L. Harvey. *Colorado Med.*, June, 1930, XXVII, 185.

It is important that bronchiectasis be recognized as early as possible in order to institute proper treatment. Bronchography is necessary to make an accurate diagnosis in the early stages. In order to give all suspicious cases the benefit of this method, there must be a simple technic, as many patients will not submit to more difficult procedures. Therefore a wider use of the so-called "passive method" is advocated, consisting in introducing the iodized oil into the trachea and bronchi by having the patient take it in the mouth. This method was described by A. Ochsner in the *Journal of the American Medical Association* for July 20, 1929. The throat is anesthetized until the swallowing reflex is abolished, following which the oil is taken into the mouth and the head so tilted that the oil runs back into the larynx. The swallowing reflex being abolished, the oil runs into the trachea. This is observed fluoroscopically, so that changes may be detected which the radiograph may not show.

W. W. WATKINS, M.D.

**Discussion of Lipiodol in Bronchiectasis**  
Walter C. Swann. *West Virginia Med. Jour.*, June, 1930, XXVI, 337.

The diagnosis of bronchiectasis, in many cases, is almost impossible by physical signs alone. It may be suspected from the history, but not all patients expectorate large quantities of mucus and pus. Diagnosis of large or small amounts of bronchiectasis is so easy with lipiodol that any patient having a cough



lasting over six weeks, and not tuberculous so far as can be determined, should have lipiodol injected for diagnosis. The diagnosis after lipiodol is more certain than by any other method except bronchoscopic inspection.

The author is also convinced of its value as a therapeutic measure, having had 63.6 per cent of his cases markedly improved.

W. W. WATKINS, M.D.

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**Concerning the Demonstration and Treatment of Disease of Peripheral Arteries.** Max Sgalitzer, Rud. Demel, Vikt. Kollert, and Heinz Ranzenhofer. *Wien. Klin. Wchnschr.*, July 3, 1930, **XLIII**, 833.

Many contrast-giving substances have been used for the demonstration of arteries by injection. The author used uroselectan for this purpose in twenty cases. The artery is exposed under local anesthesia and from 10 to 20 c.c. of uroselectan are injected with a fine needle. The roentgenogram is taken towards the end of the injection. This method is of importance for the diagnosis of the exact location of obstruction or stenosis of arteries (arteriosclerosis, endarteritis, spasm, emboli, and thrombi). In a few cases of intermittent

claudication and beginning gangrene of the toes, a therapeutic effect could be noticed, at least for some time.

H. W. HEFKE, M.D.

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**Lipiodol: Its Place in the Modern Diagnosis of Nasal Sinus Pathology.** Harry Whitaker. *Colorado Med.*, July, 1930, **XXVII**, 245.

Conservative treatment of the nasal sinuses requires early diagnosis. Surgery on the sinuses should not be done until after a most searching and careful diagnosis has been made. Nasal drainage and ventilation should be restored and the nose and throat observed over months before surgical treatment is considered. Lipiodol properly placed in the sinuses, properly radiated, and the films properly interpreted, adds greatly to accuracy in making a surgical diagnosis of nasal sinus disease. The author advocates the Proetz displacement method, with films in various positions and at varying periods after filling of the sinuses. In this method all the cells which can be filled, will fill, and when filled show with what readiness they can be emptied. This indicates the line of treatment.

W. W. WATKINS, M.D.

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